Mineral Resource Report 96
Part 1
1990

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COAL RESOURCES OF CAMBRIA AND BLAIR COUNTIES, PENNSYLVANIA

PART 1. COAL CROP LINES, MINED-OUT AREAS, AND STRUCTURE CONTOURS

Compiled by
Albert D. Glover

04-16-194-9

COMMONWEALTH OF PENNSYLVANIA
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Part 1

COAL RESOURCES OF CAMBRIA AND BLAIR COUNTIES, PENNSYLVANIA

PART 1. COAL CROP LINES, MINED-OUT AREAS, AND STRUCTURE CONTOURS

Compiled by Albert D. Glover
Pennsylvania Geological Survey

PENNSYLVANIA GEOLOGICAL SURVEY

FOURTH SERIES

HARRISBURG

1990

Coal resources of Cambria
and Blair Counties

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COAL RESOURCES OF CAMBRIA AND BLAIR COUNTIES, PENNSYLVANIA

PART 1. COAL CROP LINES, MINED-OUT AREAS, AND STRUCTURE CONTOURS

Compiled by
Albert D. Glover

INTRODUCTION

The Bureau of Topographic and Geologic Survey is responsible for providing accurate, timely information on Pennsylvania's bituminous coal. To achieve this goal, the Bureau cooperates with the U.S. Geological Survey through the National Coal Resources Data System (NCRDS). NCRDS is a computerized data base and geographic information system developed by the U.S. Geological Survey to facilitate coal-resource calculations for the nation on a county-by-county and seam-by-seam basis, and to produce various kinds of tables and maps of coal characteristics.

Before NCRDS can be used for a particular bituminous-coal-producing county, all available data on the coal must be entered into the computer data base. These data include site-specific (point-location) stratigraphic measurements and coal analyses, and specific map elements compiled on 7.5-minute topographic quadrangle maps. The map elements, which include coal outcrop lines, structure contours, and mined-out areas, are digitized and stored in the system for subsequent computer manipulations. It is important to recognize that this coal spatial data is three dimensional.

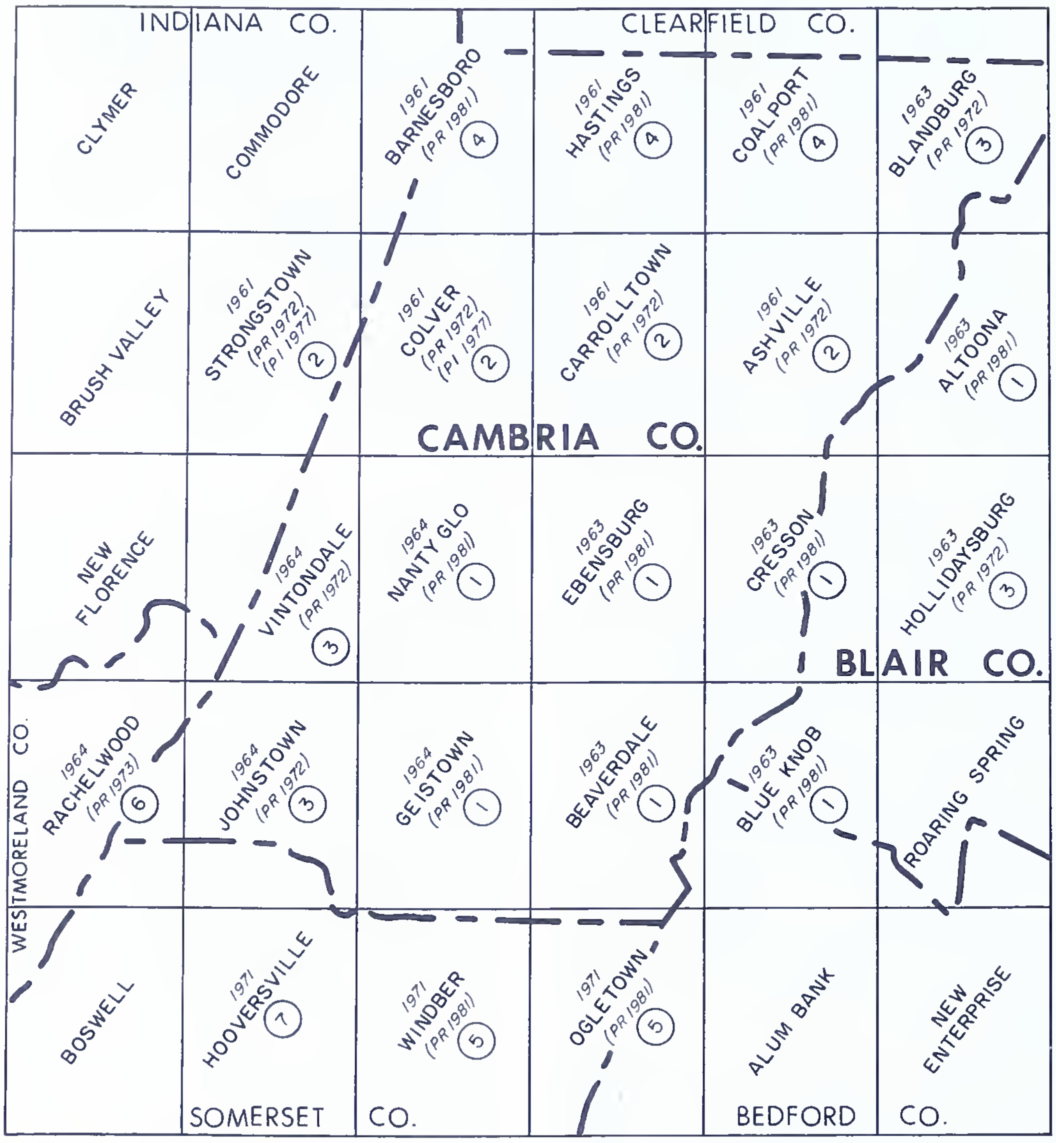
Inasmuch as the maps showing coal outcrop lines and mined-out areas are in constant demand by many users, including the coal industry, consultants, planners, government personnel, and academicians, they are being made available in this publication. These maps will be of considerable help in exploration programs, land acquisition, land use planning, and environmental protection.

Two kinds of coal maps may be included for each 7.5-minute topographic quadrangle map covering Cambria and Blair Counties (Figure 1). First, for most quadrangles, there is a separate map for each principal coal seam (Figure 2) that shows the crop line and the extent of strip and deep mining of the coal. Strip-mined areas are shown as of the date of the photorevised map (see Figure 1). Deep-mined areas were compiled during the period 1979–82. If there has been no mining on a principal coal, or if there was limited mining on a less important coal, a separate map for the coal is not included. Second, for each quadrangle, there is a composite map showing the crop lines of all of the principal coal seams (Figure 2), structure contours, and fold axes. Crop lines of less important coal seams that have had limited mining activity are shown on the composite maps only in those areas where they have been mined.

All of the maps contain information on sources of data, map reliability, and map symbols. In addition, the composite maps contain information on structure-contour intervals and datums, and names of fold axes. The general layout of the compilation maps is shown in Figure 3.

The map reliability terms given for coal crop lines and structure contour lines in this report are relative and somewhat subjective. Nevertheless, these terms are quantified approximately as follows: very good, ±10 feet; good, ±20 feet; and fair, ±30 feet. Generally, in Cambria and Blair Counties, map reliability is good to very good in the mined areas. The reliability values refer to vertical, not horizontal, accuracy.

It should be noted that maps of coals occurring near the Tipton reservoir in the Tipton 7.5-minute quadrangle, Blair County, are not included in this report. Although some deep mining on these coals has taken place in the past, the extent of the remain-


INDIANA CO.
CLEARFIELD CO.
CLYMER
COMMODORE
1961 BARNESBORO (PR 1981) ④
1961 HASTINGS (PR 1981) ④
1961 COALPORT (PR 1981) ④
1963 BLANDBURG (PR 1972) ③
BRUSH VALLEY
1961 STRONGSTOWN (PR 1972) (PI 1977) ②
1961 COLVER (PR 1972) (PI 1977) ②
1961 CARROLLTOWN (PR 1972) ②
1961 ASHVILLE (PR 1972) ②
1963 ALTOONA (PR 1981) ①
CAMBRIA CO.
NEW FLORENCE
1964 VINTONDALE (PR 1972) ③
1964 NANTY GLO (PR 1981) ①
1963 EBENSBURG (PR 1981) ①
1963 CRESSON (PR 1981) ①
1963 HOLLIDAYSBURG (PR 1972) ③
BLAIR CO.
WESTMORELAND CO.
1964 RACHELWOOD (PR 1973) ⑥
1964 JOHNSTOWN (PR 1972) ③
1964 GEISTOWN (PR 1981) ①
1963 BEAVERDALE (PR 1981) ①
1963 BLUE KNOB (PR 1981) ①
ROARING SPRING
BOSWELL
1971 HOOVERSVILLE ⑦
1971 WINDBER (PR 1981) ⑤
1971 OGLETOWN (PR 1981) ⑤
ALUM BANK
NEW ENTERPRISE
SOMERSET CO.
BEDFORD CO.

Based on aerial photography taken:

① 1962 and 1977.
② 1958 and 1972.
③ 1962 and 1972.
④ 1958 and 1977
⑤ 1966, 1967, 1969, and 1977.
⑥ 1962 and 1973.
⑦ 1966 and 1967.

Figure 1. Index map of 7.5-minute quadrangles in Cambria and Blair Counties. Dates of publication of topographic quadrangle maps are shown in italic type. Dates of photorevision (PR) and photoinspection (PI) are shown in parentheses.

ing coal is not known. More importantly, because these coals are located within the Tipton Run watershed, future mining in that area will be prohibited.

The maps in this report represent Part 1 of NCRDS for Cambria and Blair Counties. Part 2 will include various computer-generated tables and maps of coal characteristics. As the data base for these and other counties is completed and the various derivative tables and maps of coal quality are produced, their availability will be publicly announced.

The reader is advised that all of the original compilation maps are available for public inspection at the offices of the Pennsylvania Geological Survey in Harrisburg. The scale of the original maps is 1:24,000.

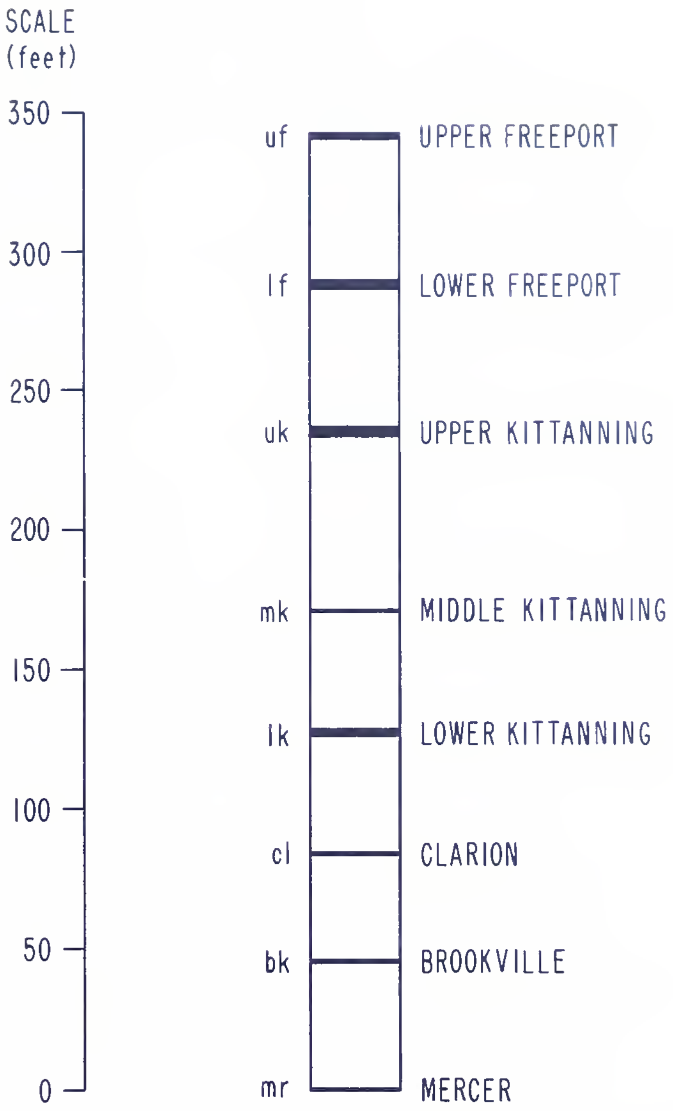


Figure 2. Stratigraphic position of the principal coal seams in Cambria and Blair Counties. Thicknesses of the coal seams are exaggerated.

A brief reference list given at the end of this section includes state and federal publications that contain the best information concerning the coal geology of Cambria and Blair Counties.

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Iannacchione, A. T., and Puglio, D. G. (1979), *Geology of the Lower Kittanning coalbed and related mining and methane emission problems in Cambria County, Pa.,* U.S. Bureau of Mines Report of Investigations 8354, 31 p.

McCulloch, C. M., and Deul, Maurice (1973), *Geologic factors causing roof instability and methane emission problems—The*

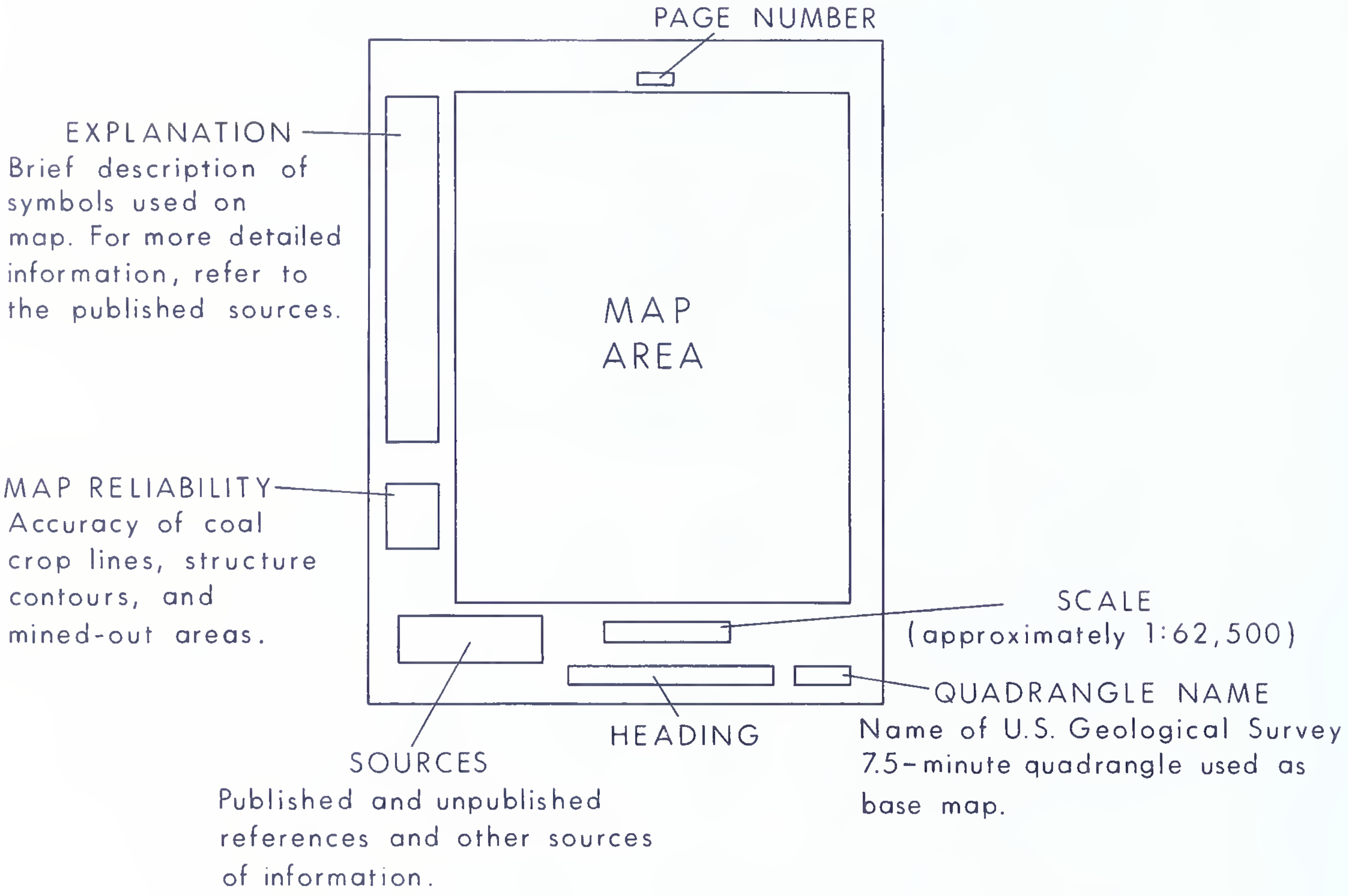
PAGE NUMBER
EXPLANATION
Brief description of symbols used on map. For more detailed information, refer to the published sources.
MAP AREA
MAP RELIABILITY
Accuracy of coal crop lines, structure contours, and mined-out areas.
SCALE
(approximately 1:62,500)
QUADRANGLE NAME
Name of U.S. Geological Survey 7.5-minute quadrangle used as base map.
HEADING
SOURCES
Published and unpublished references and other sources of information.

Figure 3. Guide to layout of compilation maps.

Lower Kittanning coalbed, Cambria County, Pa., U.S. Bureau of Mines Report of Investigations 7769, 25 p.

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UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

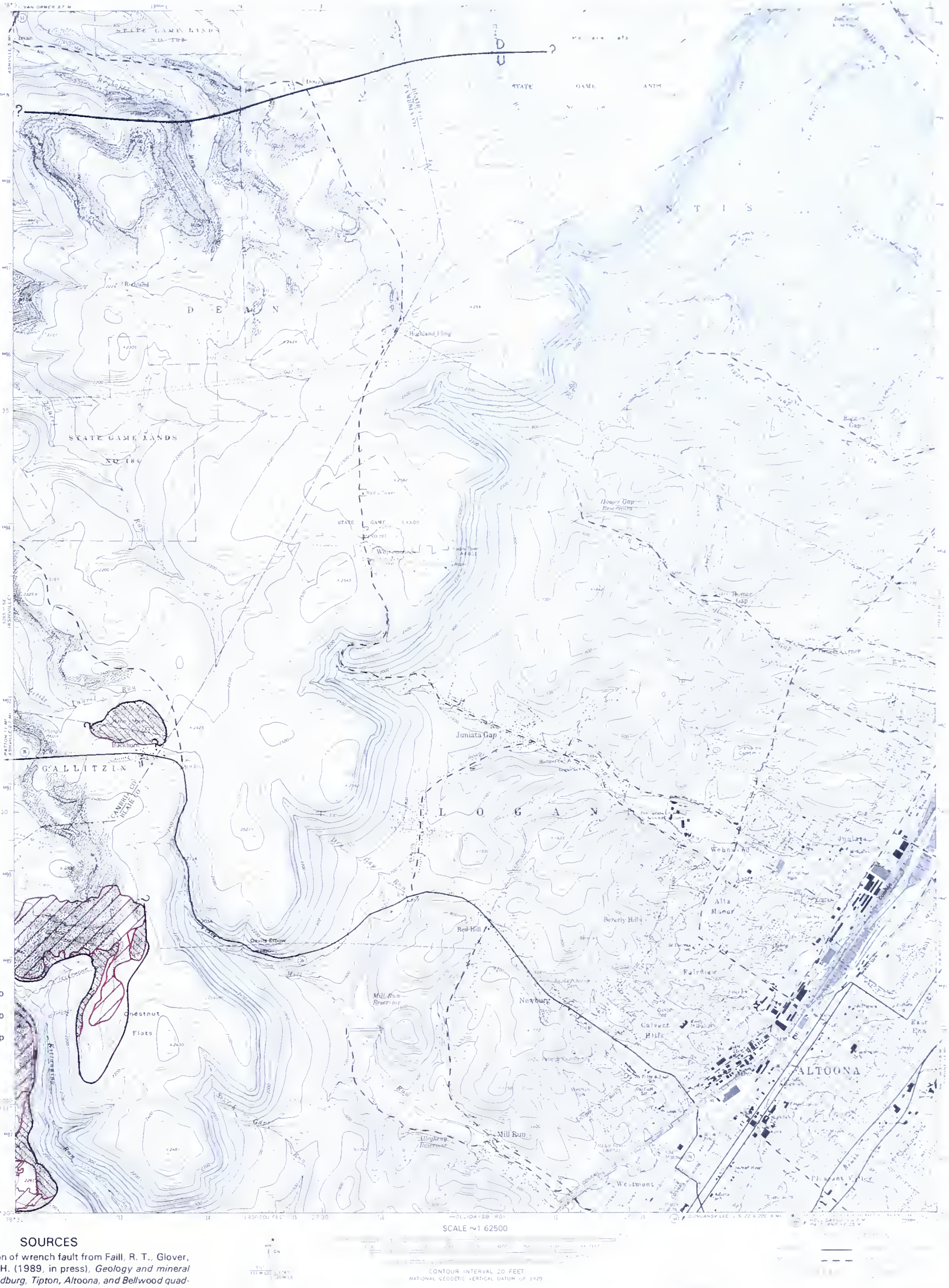
EXPLANATION

Crop line of the
Mercer coal

▨ Extent of known
strip mining

▨ Extent of known
deep mining

D
U
Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY
Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES
Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.
Limits of strip mining based on interpretation of topographic map.
Limits of deep mining from unpublished mine map.

ALTOONA

CROP LINE AND MINED-OUT AREAS OF THE

MERCER COAL

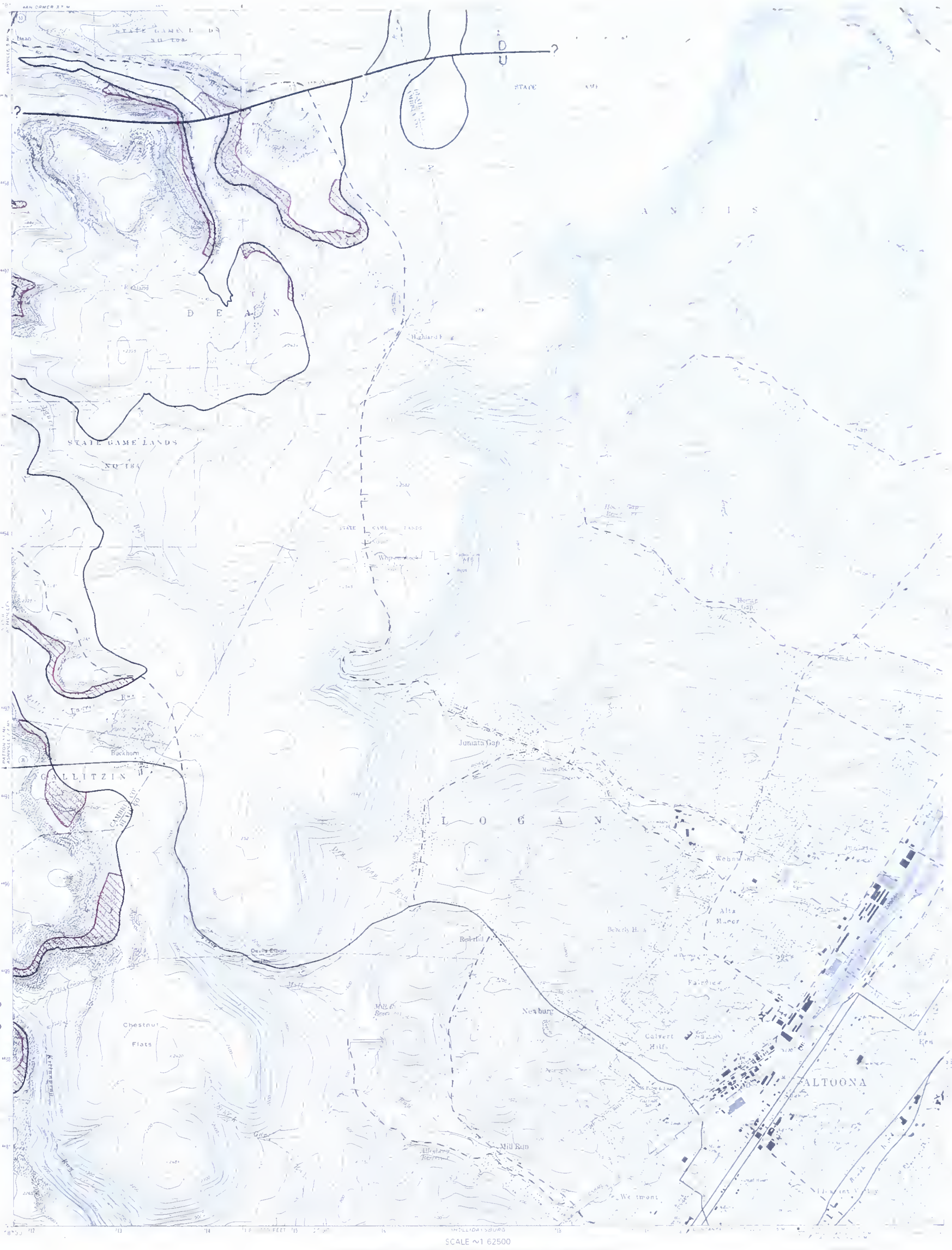
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Brookville coal

▨ Extent of known strip mining

D/U Wrench fault
U, upthrown side; D, downthrown side.



SCALE 1:62500

CONTOUR INTERVAL 20 FEET

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86. Limits of strip mining based on interpretation of topographic map.

ALTOONA

CROP LINE AND MINED-OUT AREAS OF THE
BROOKVILLE COAL

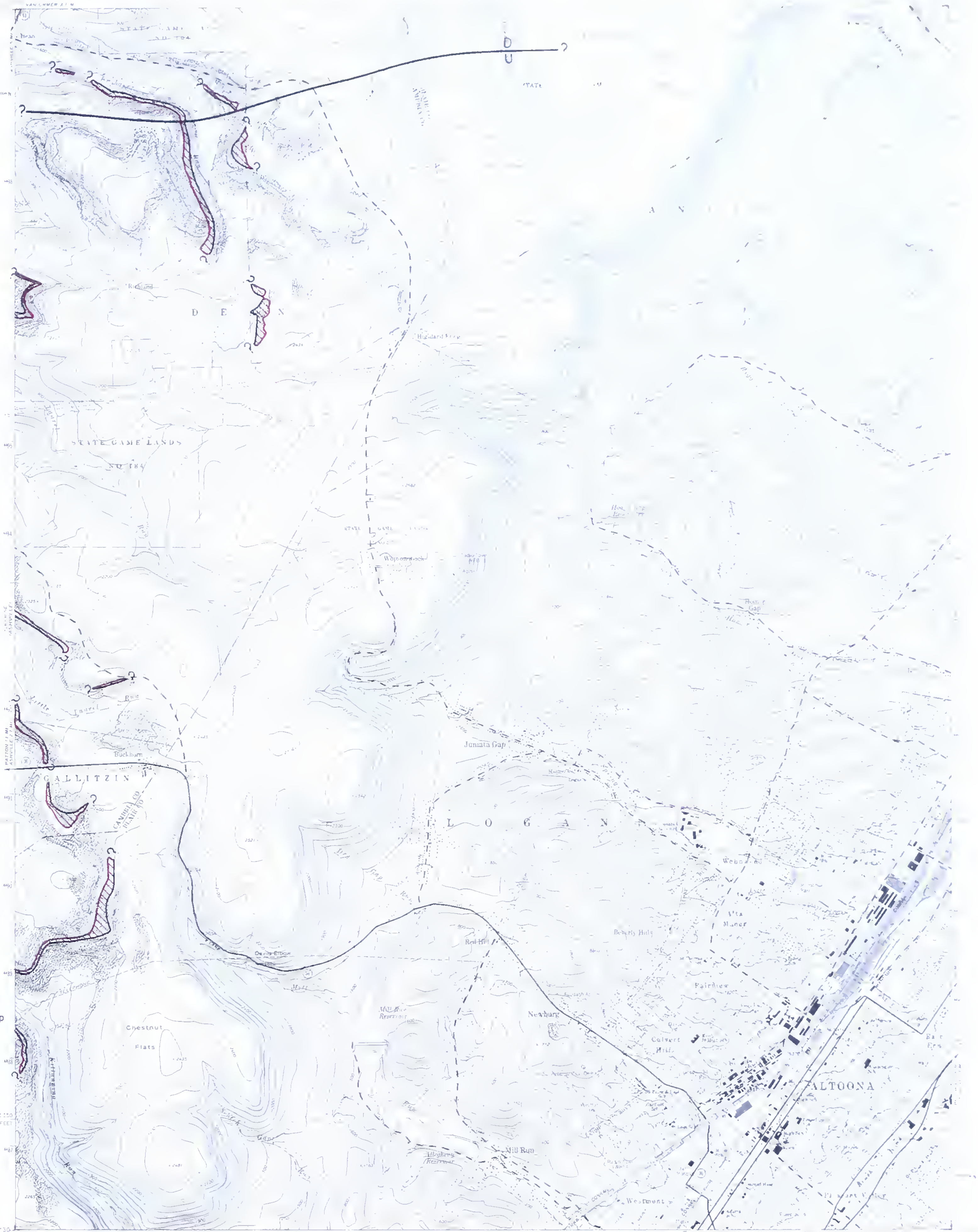
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Clarion coal

▨ Extent of known strip mining

D/U Wrench fault
U, upthrown side; D, downthrown side.



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP RELIABILITY
Coal crop line--good
Limits of known strip mining--approximate

SOURCES

Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86. Limits of strip mining based on interpretation of topographic map.

ALTOONA

CROP LINE AND MINED-OUT AREAS OF THE
CLARION COAL

EXPLANATION

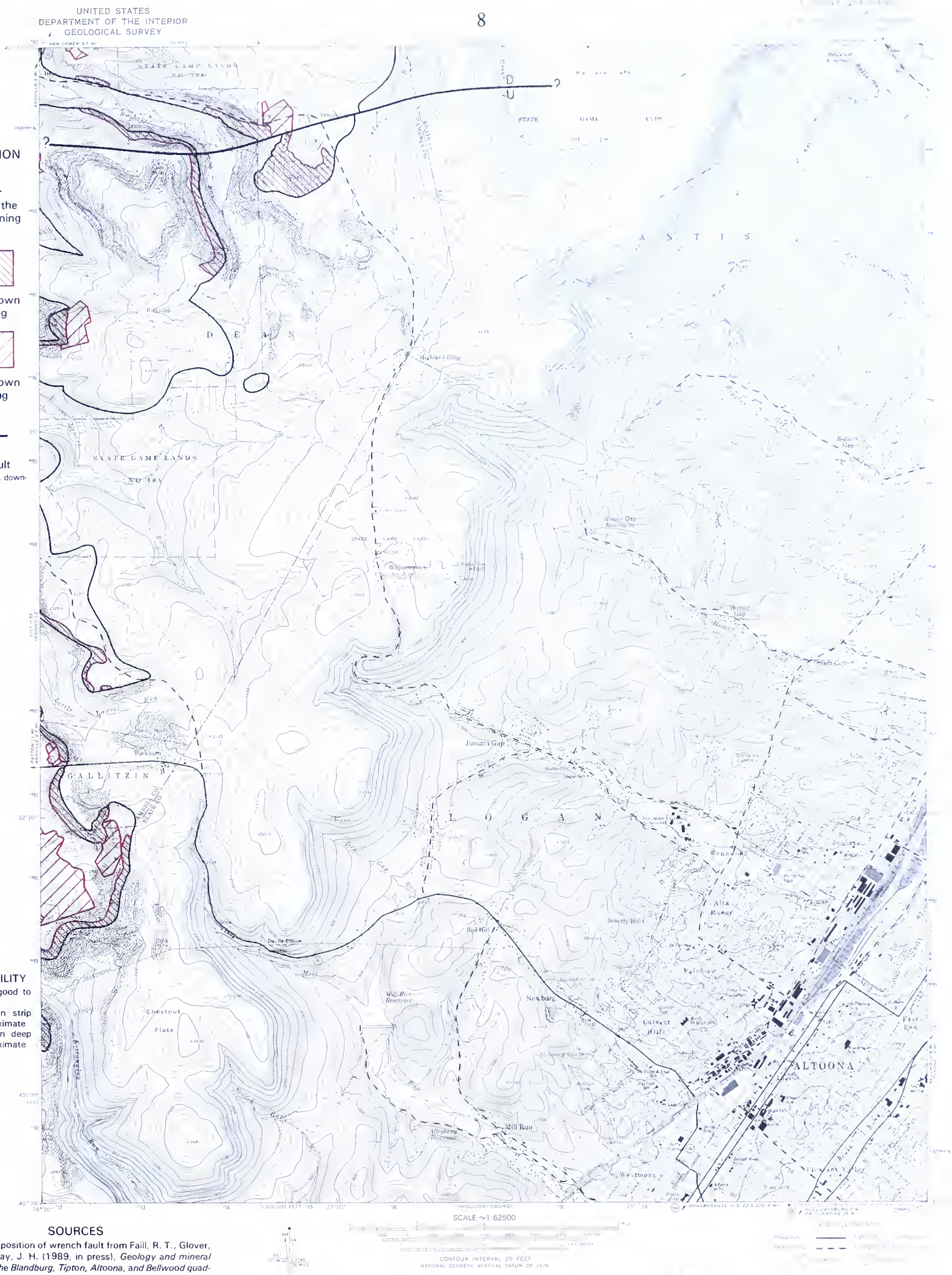
Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

D / U Wrench fault

U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania,* Pennsylvania Geological Survey, 4th ser., Atlas 86.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

ALTOONA

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

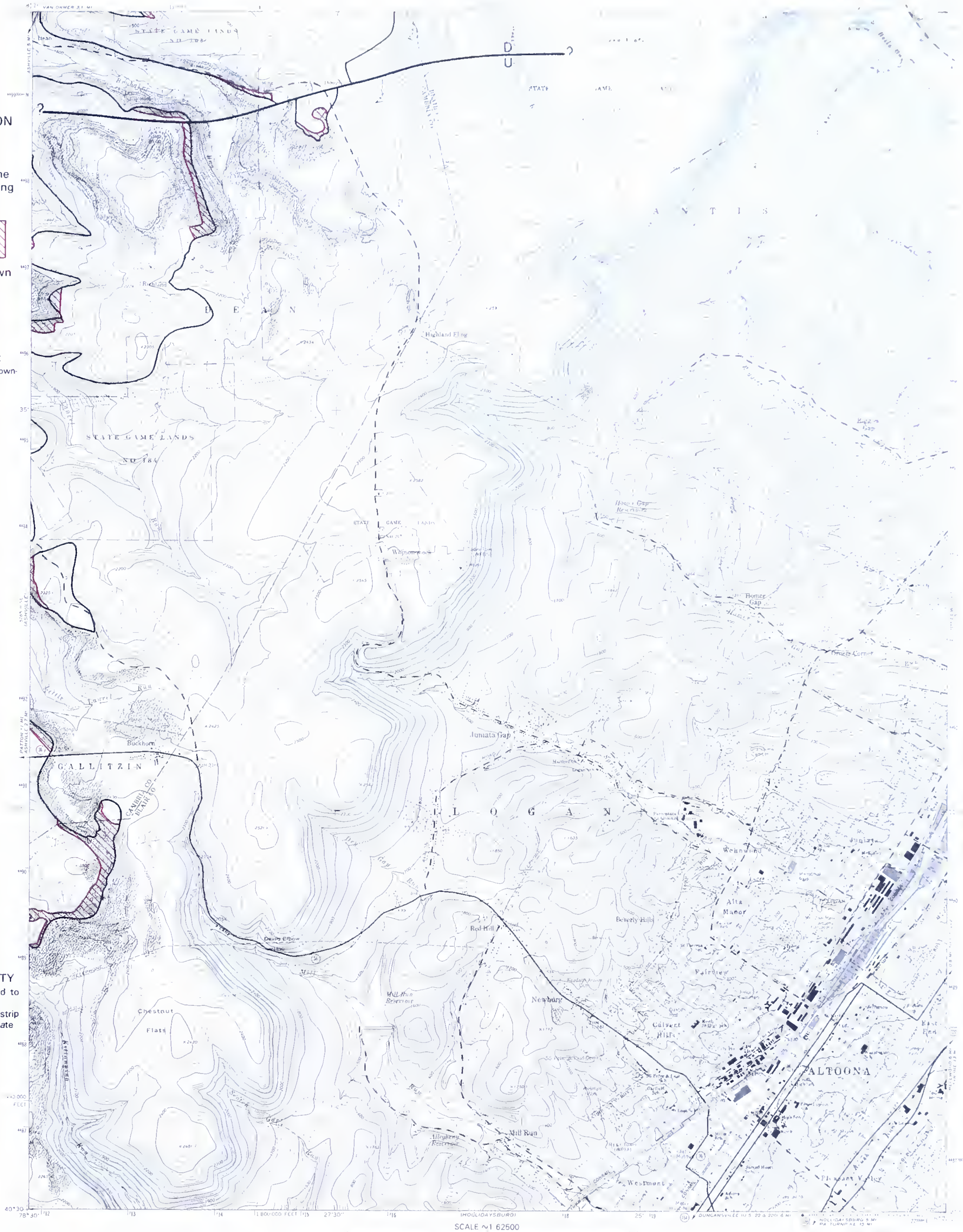
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

D/U Wrench fault
U, upthrown side; D, downthrown side.



SCALE ~1 62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP RELIABILITY
Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86. Limits of strip mining based on interpretation of topographic map.

ALTOONA

CROP LINE AND MINEO-OUT AREAS OF THE MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

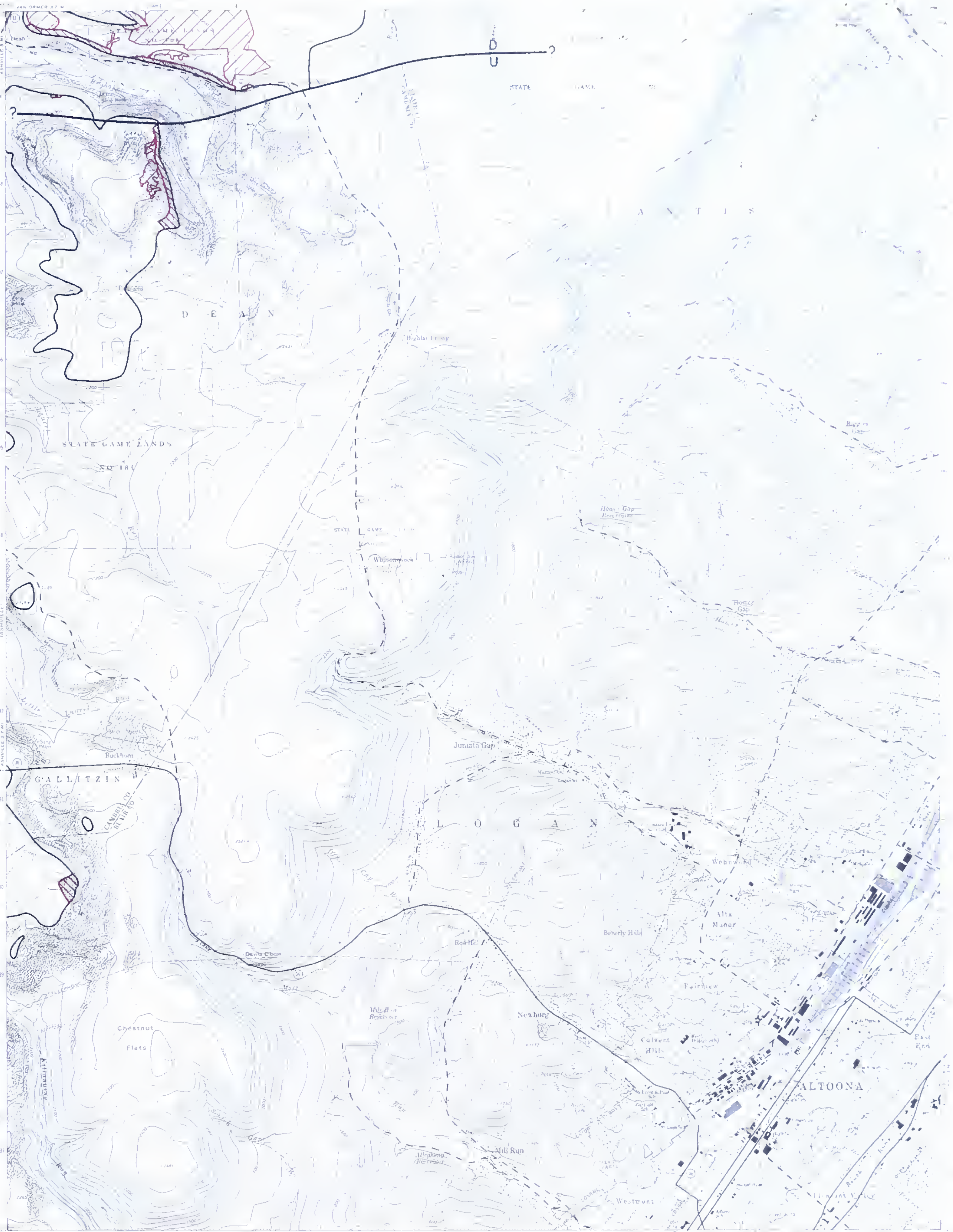
Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

D/U Wrench fault

U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

ALTOONA

CROP LINE AND MINED-OUT AREAS OF THE
UPPER KITTANNING COAL

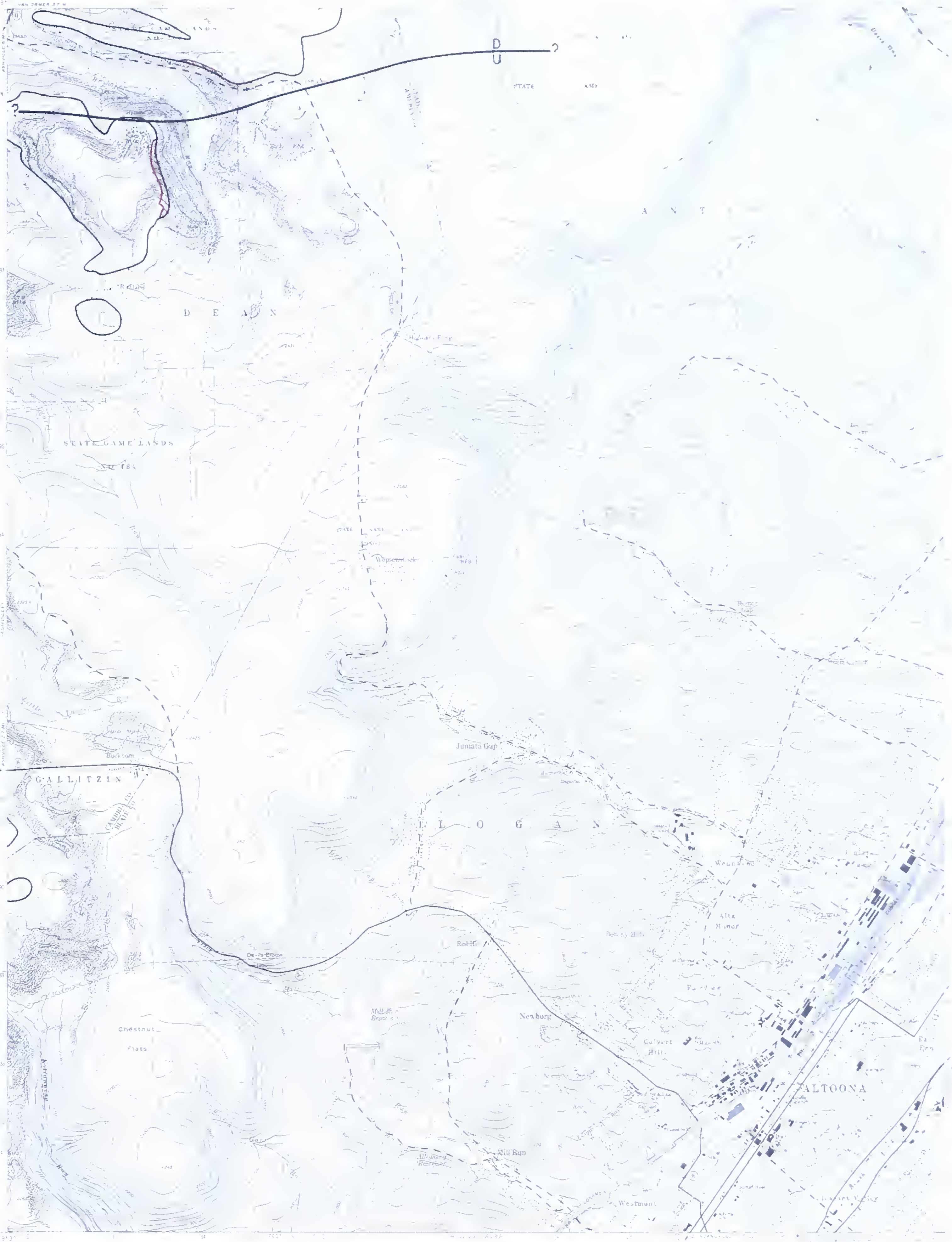
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Freeport coal

▨ Extent of known strip mining

D/U Wrench fault
U, upthrown side, D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86. Limits of strip mining based on interpretation of topographic map.

ALTOONA

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

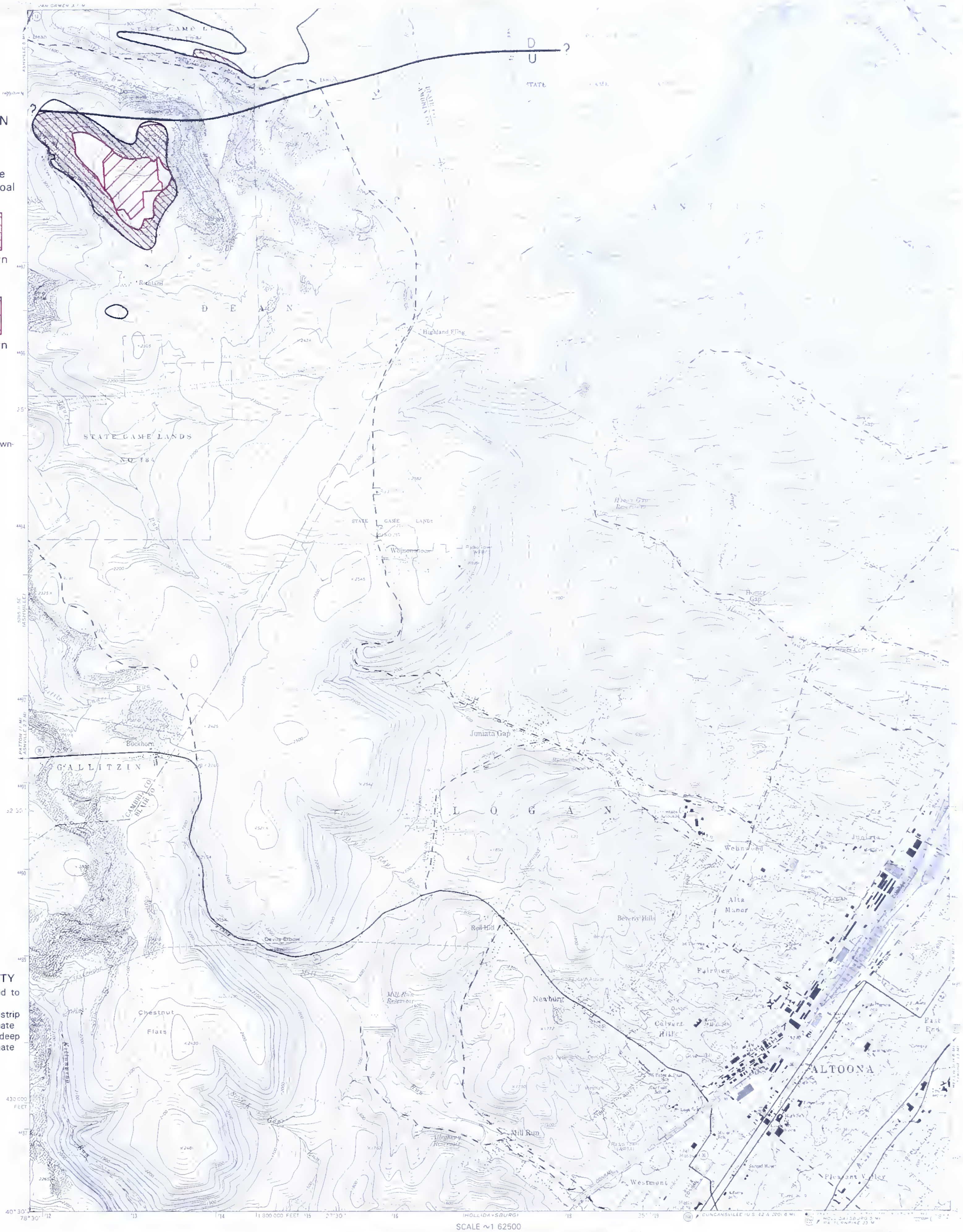
EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining

Wrench fault
U, upthrown side; D, downthrown side.



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.
Limits of strip mining based on interpretation of topographic map.
Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

ALTOONA

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—cl— Clarion coal

—bk— Brookville coal

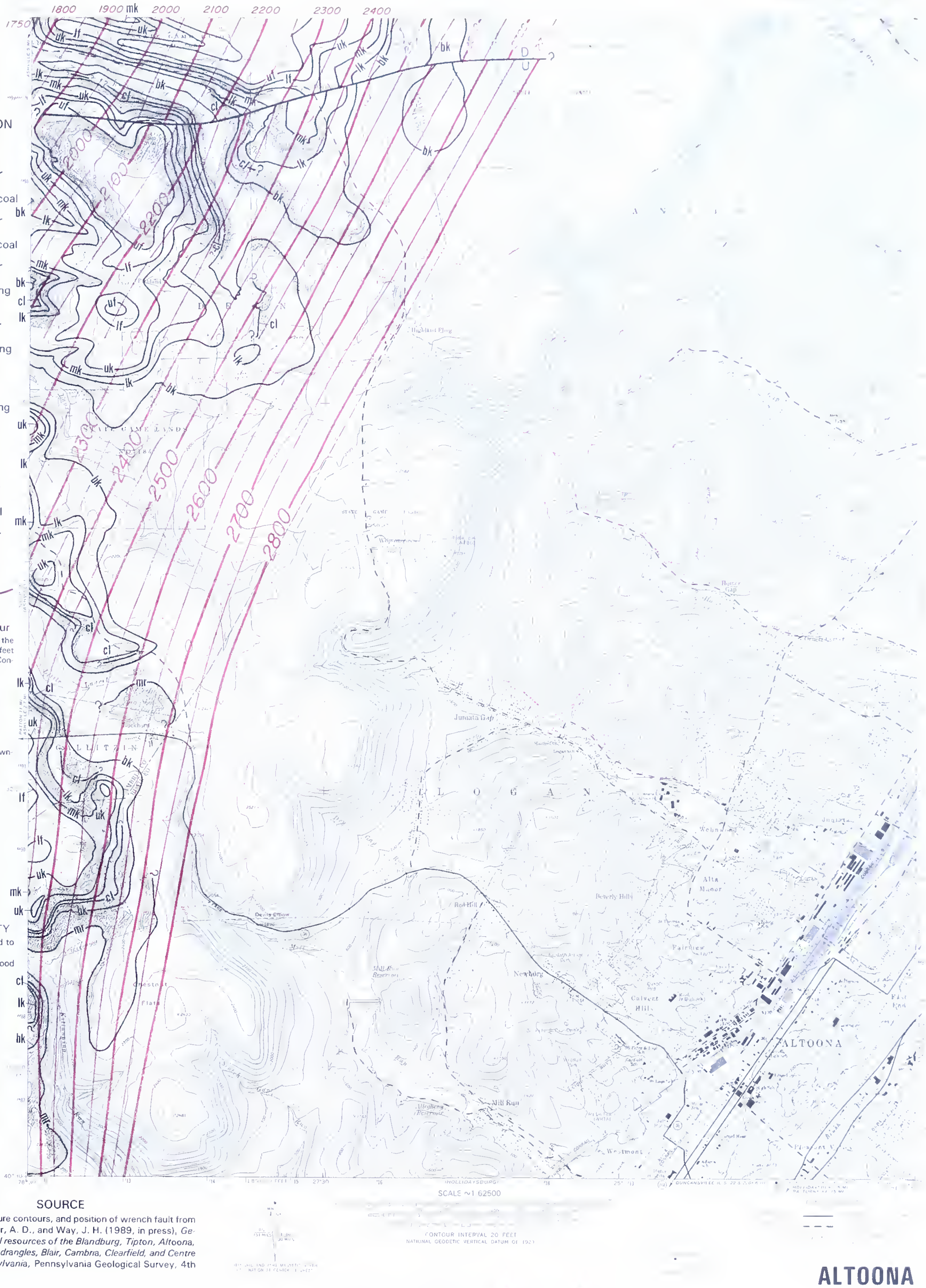
—mr— Mercer coal

—2500— Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.

D/U Wrench fault
U, upthrown side; D, downthrown side.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good



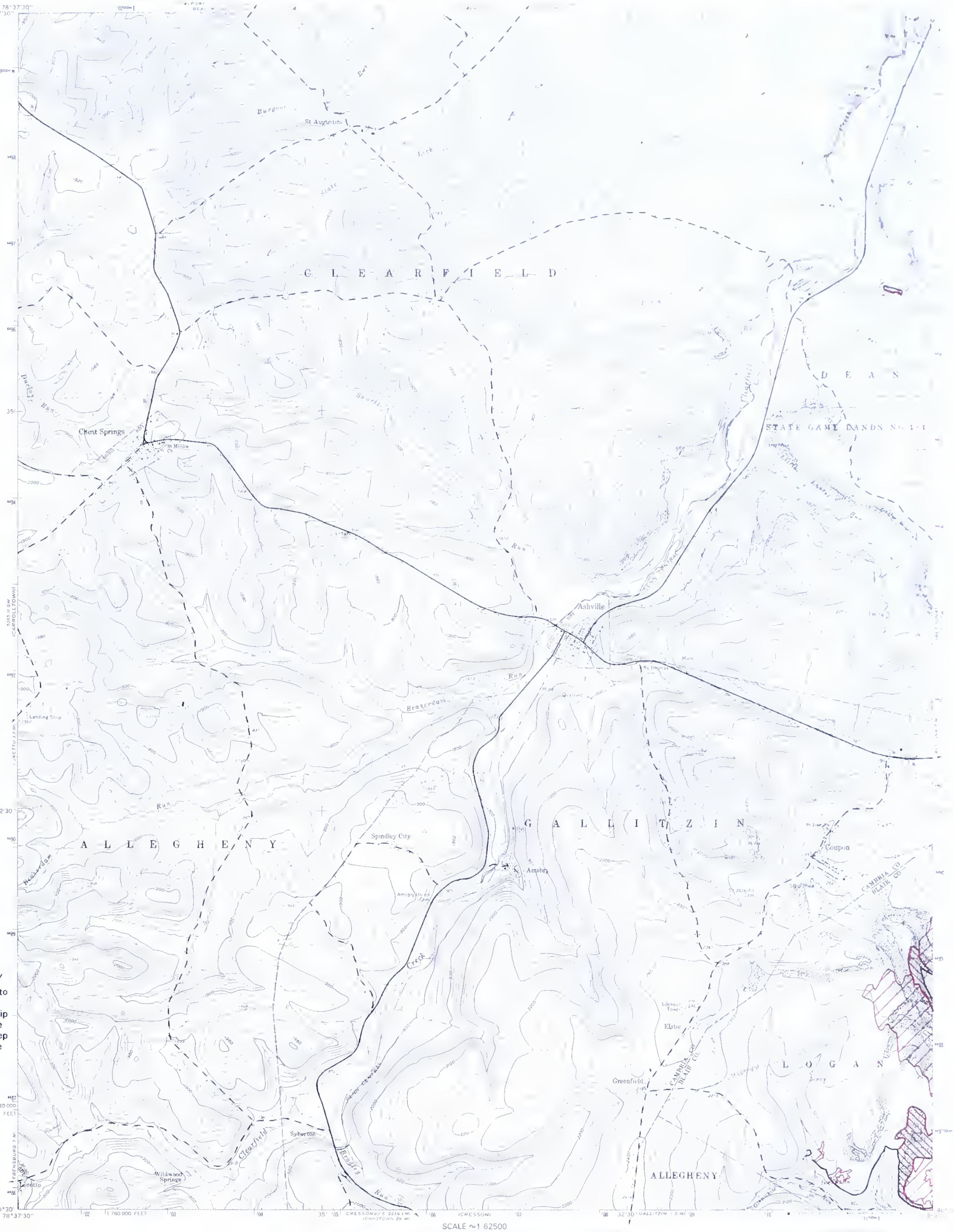
SOURCE

Crop lines, structure contours, and position of wrench fault from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.

COAL CROP LINES AND STRUCTURE CONTOURS

ALTOONA

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

〰 Crop line of the Mercer coal

▧ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line by A. D. Glover based on unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map.

ASHVILLE

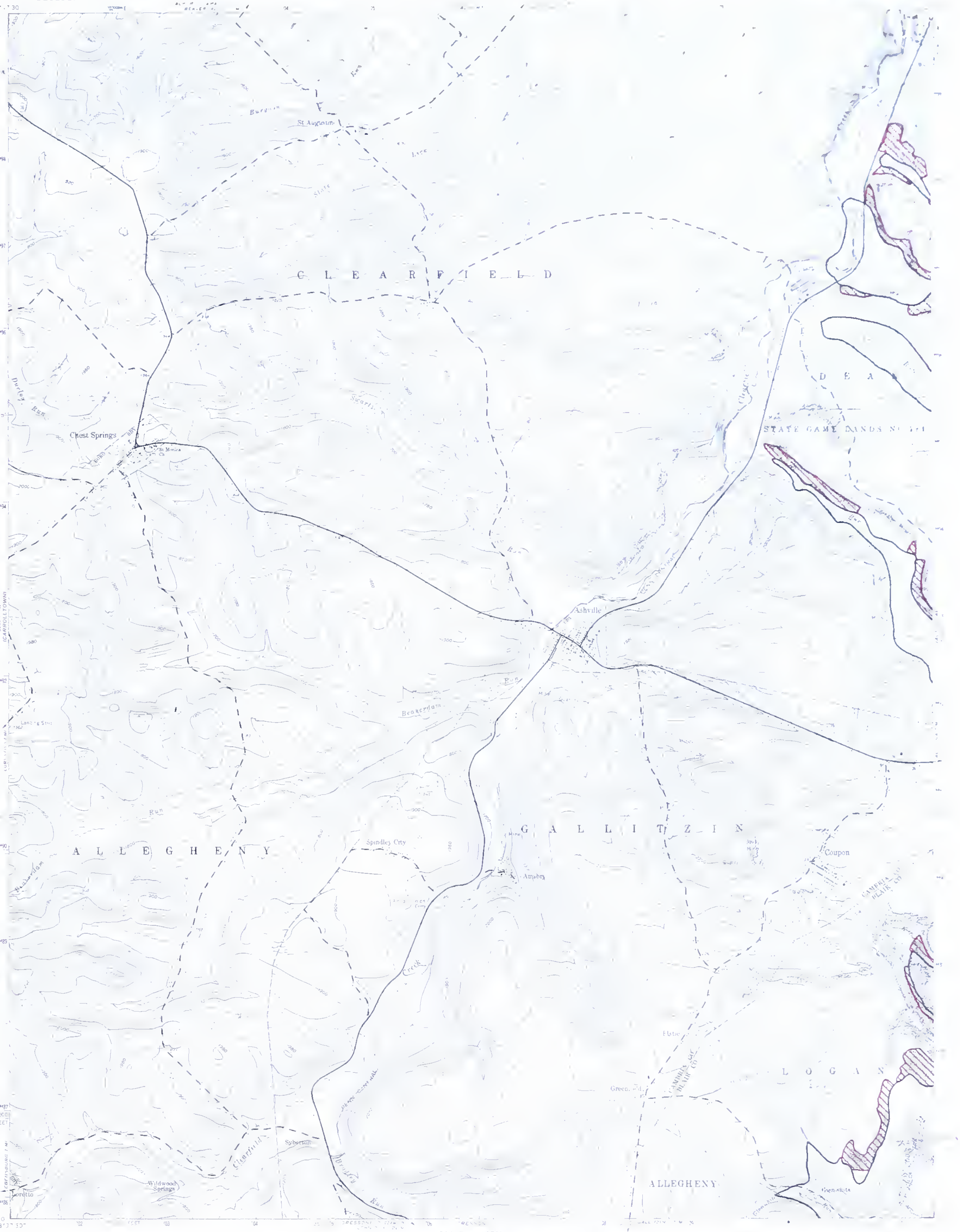
CROP LINE AND MINED-OUT AREAS OF THE MERCER COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Brookville coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line—good to very good

Limits of known strip mining—approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

ASHVILLE

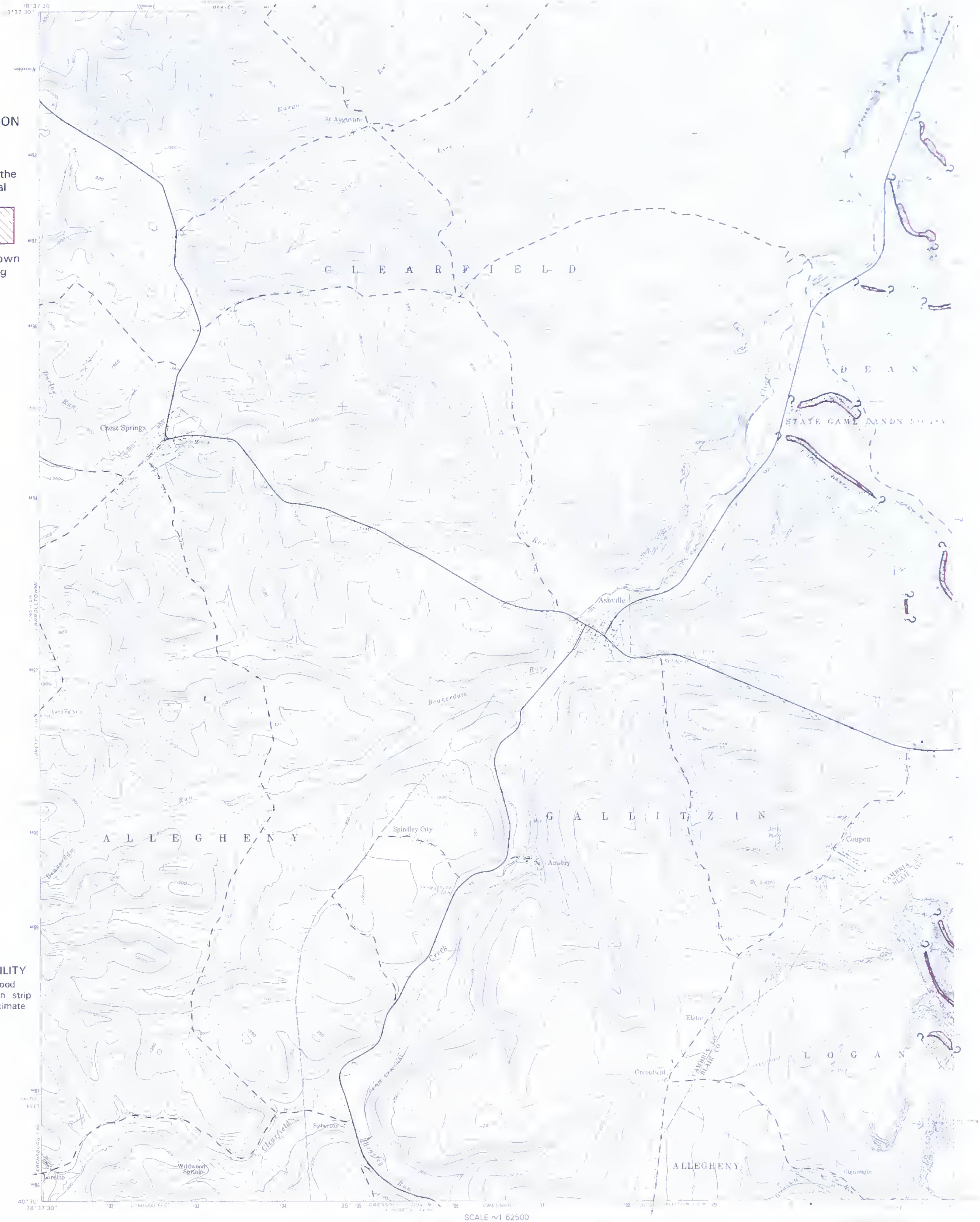
CROP LINE AND MINED-OUT AREAS OF THE
BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Clarion coal

▨ Extent of known strip mining



MAP RELIABILITY
Coal crop line--good
Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., and locations of strip mines on topographic map. Limits of strip mining based on interpretation of topographic map.

ASHVILLE

CROP LINE AND MINED-OUT AREAS OF THE
CLARION COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

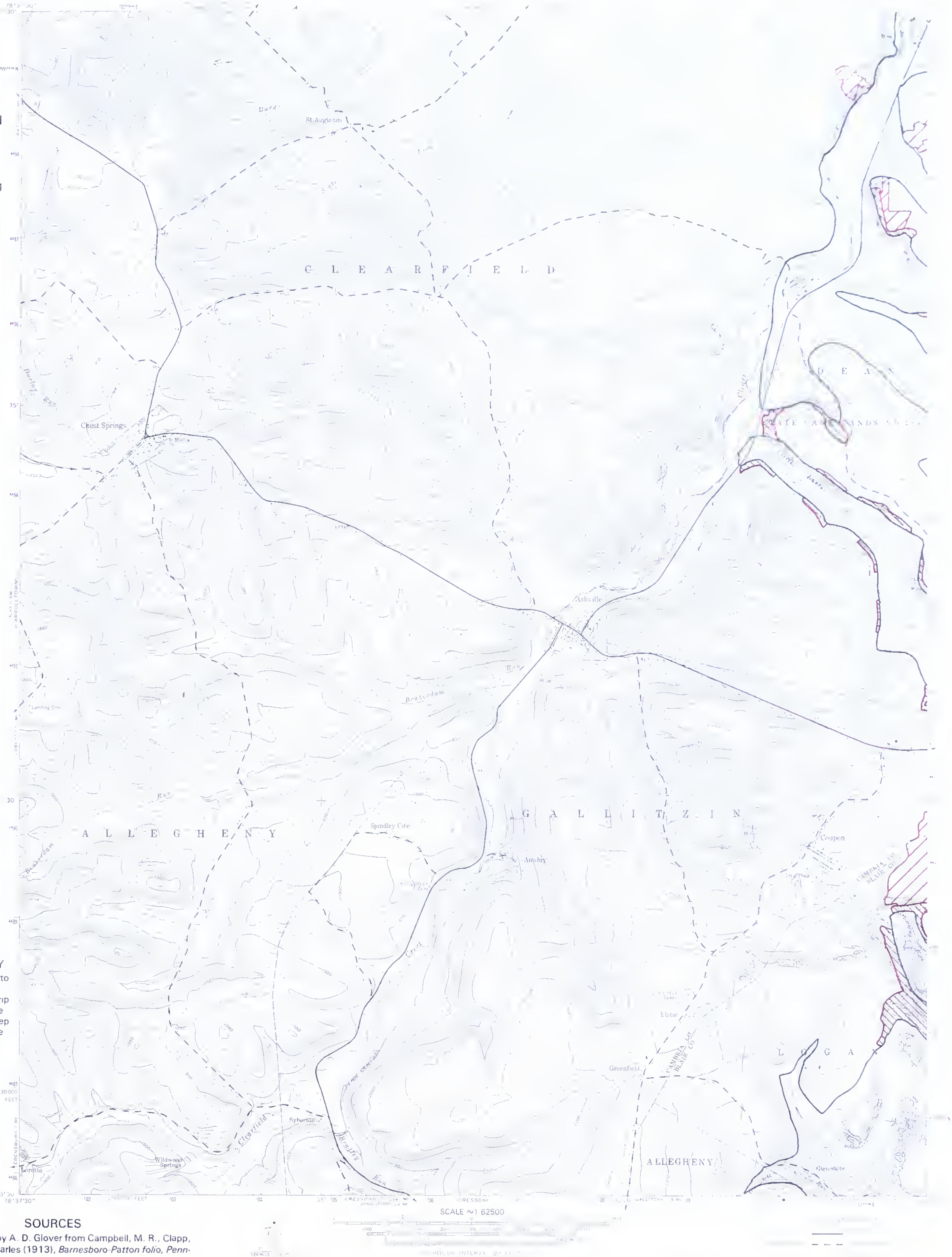
▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate



SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

ASHVILLE

CROP LINE AND MINED-OUT AREAS OF THE LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

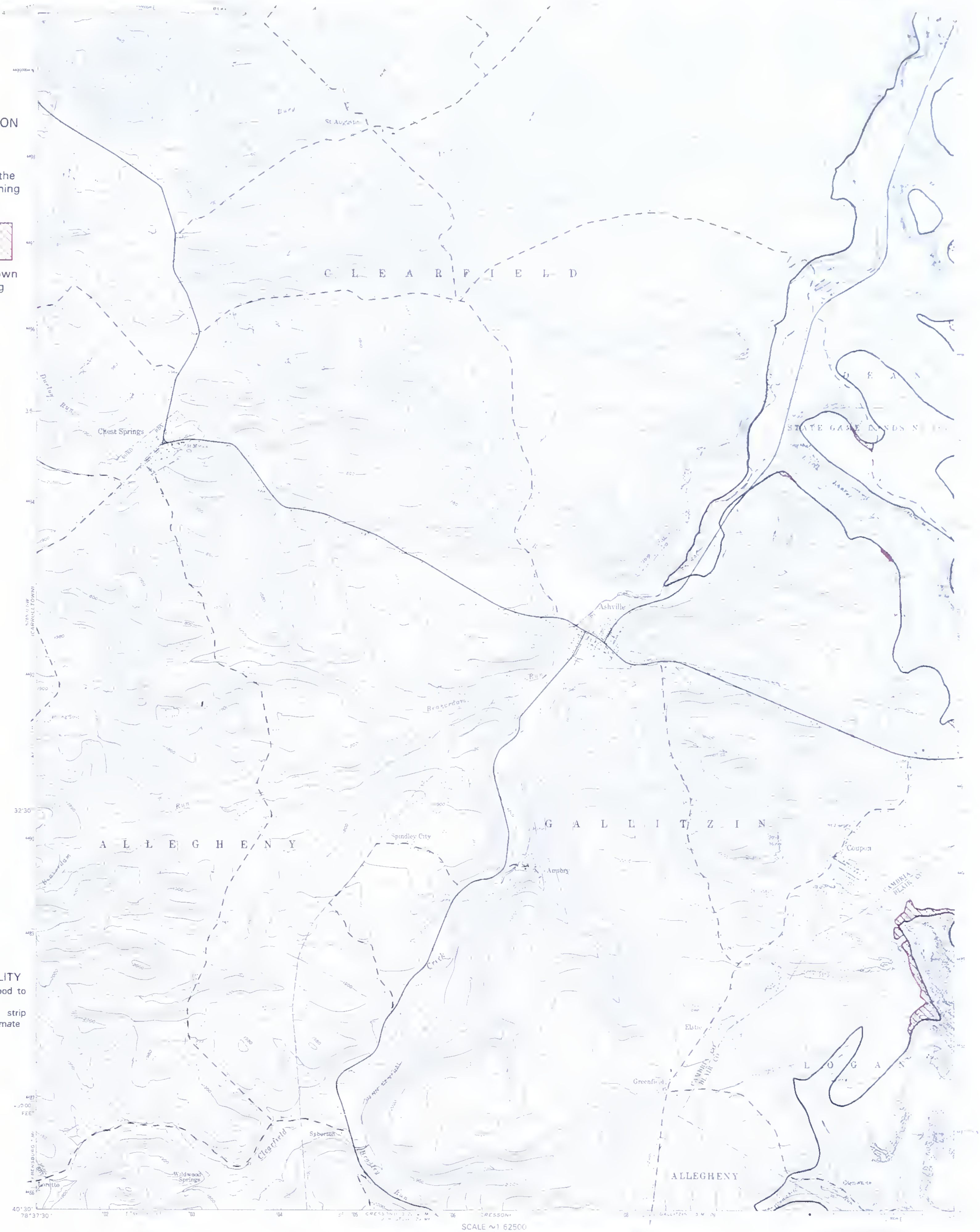
— Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate



SOURCES

Crop line by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

CROP LINE AND MINED-OUT AREAS OF THE
MIDDLE KITTANNING COAL

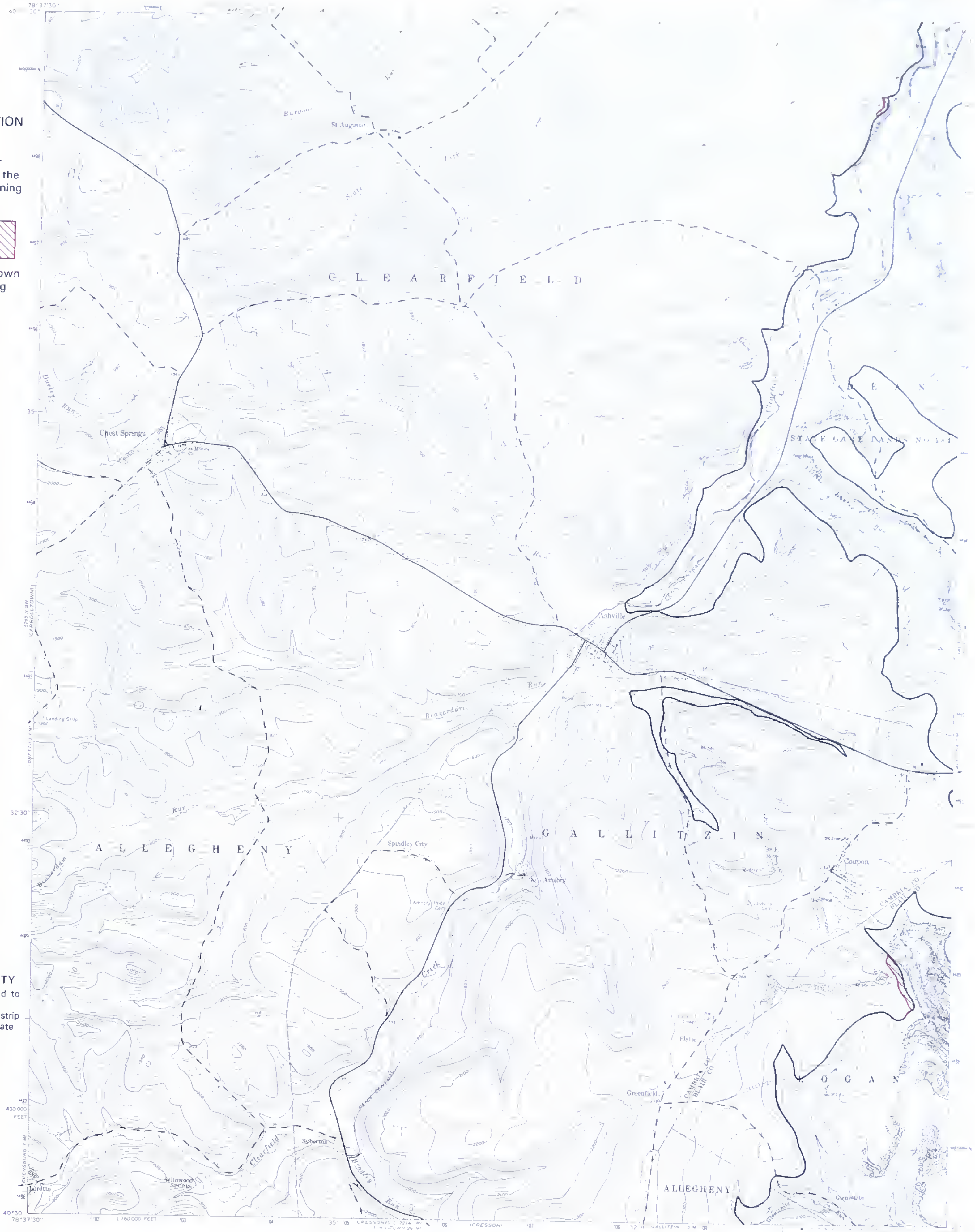
ASHVILLE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Upper Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

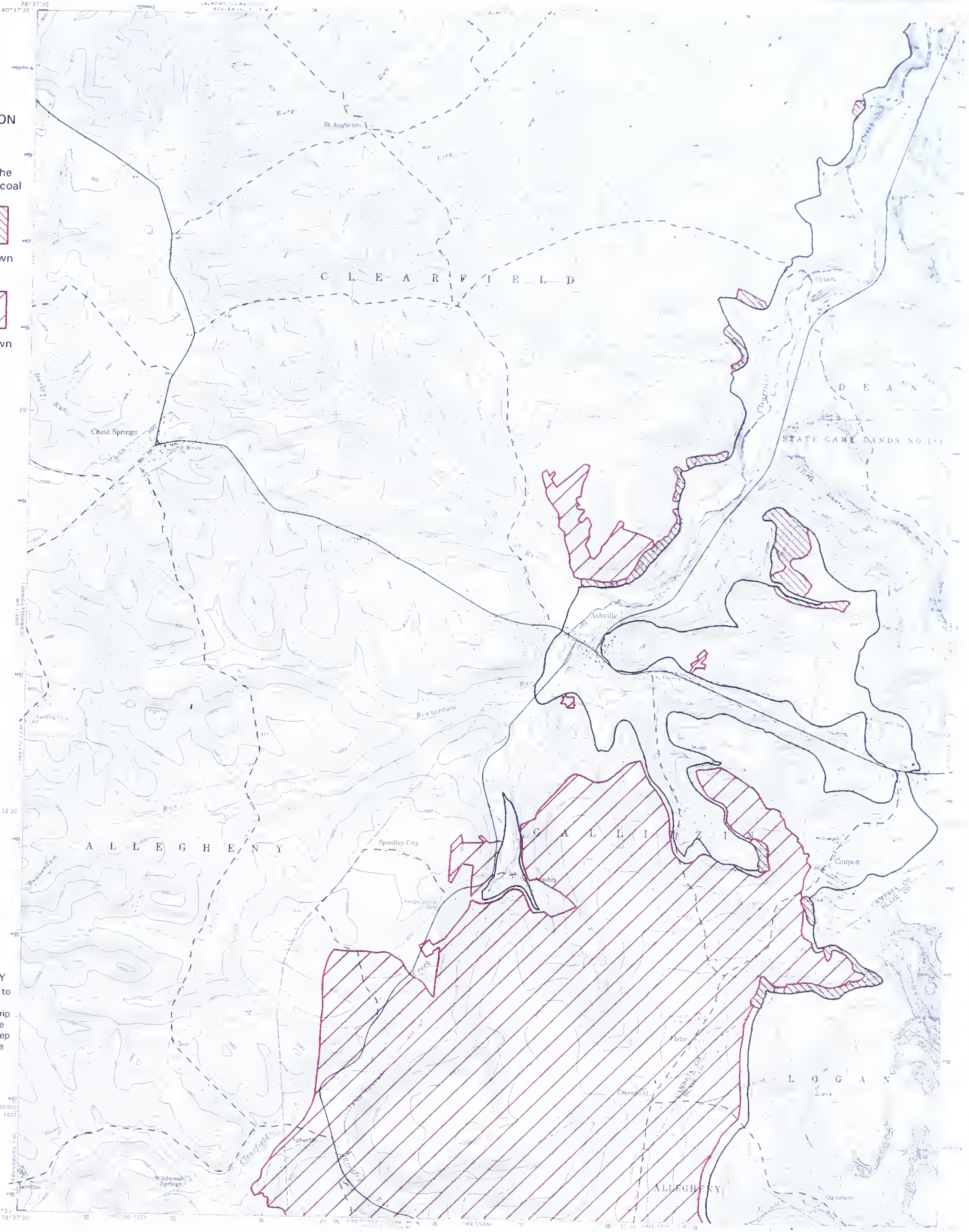
Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

CROP LINE AND MINED-OUT AREAS OF THE UPPER KITTANNING COAL

ASHVILLE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CROP LINE AND MINED-OUT AREAS OF THE UPPER FREEPORT COAL

ASHVILLE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—cl— Clarion coal

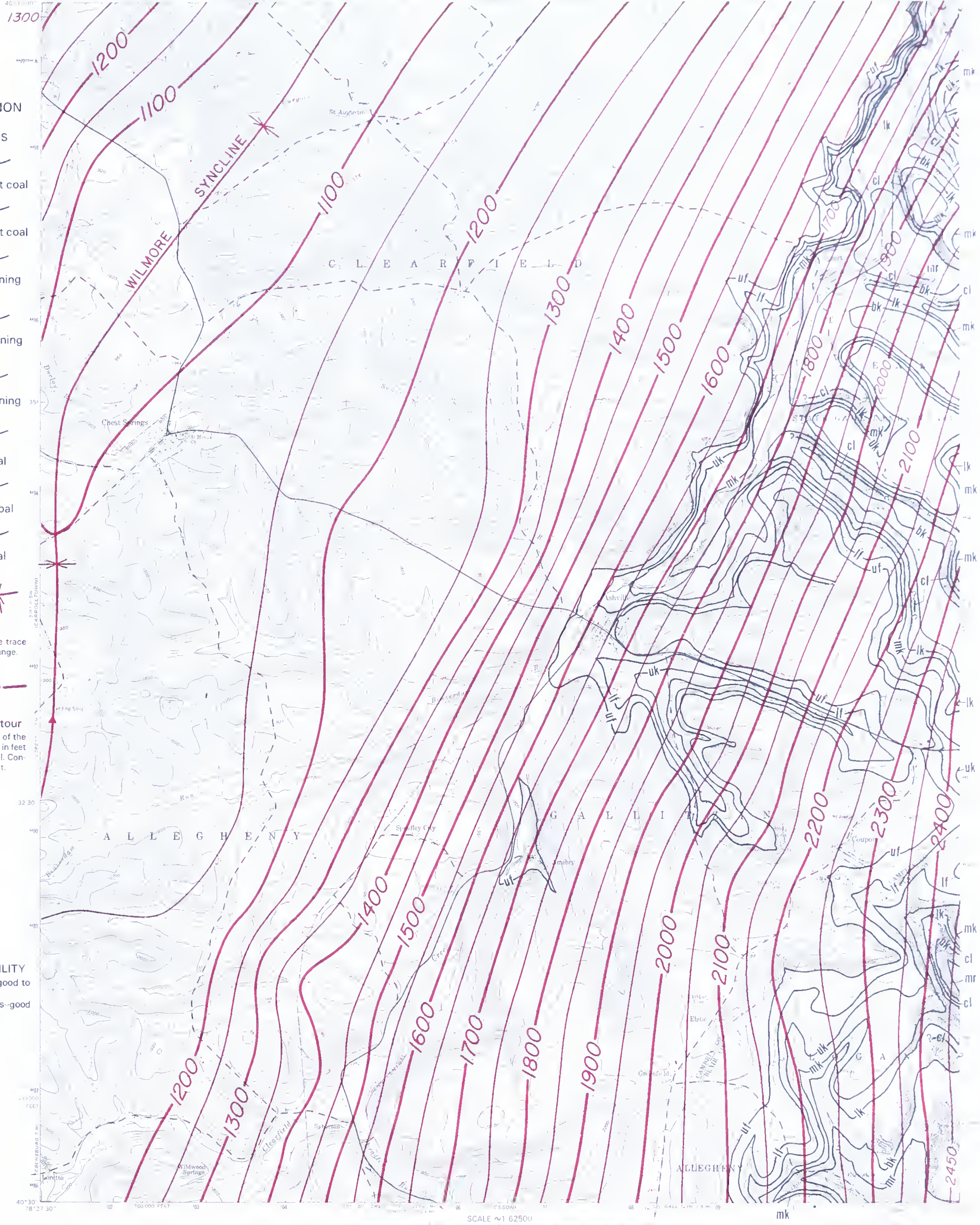
—bk— Brookville coal

—mr— Mercer coal

Syncline
Showing axial-plane trace and direction of plunge.

—1200—

Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.



MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good

SOURCES

Crop lines of the Mercer, Clarion, and Middle Kittanning coals by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Other crop lines and structure contours modified by A. D. Glover from Campbell and others (1913) using unpublished data and/or locations of strip mines on topographic map.

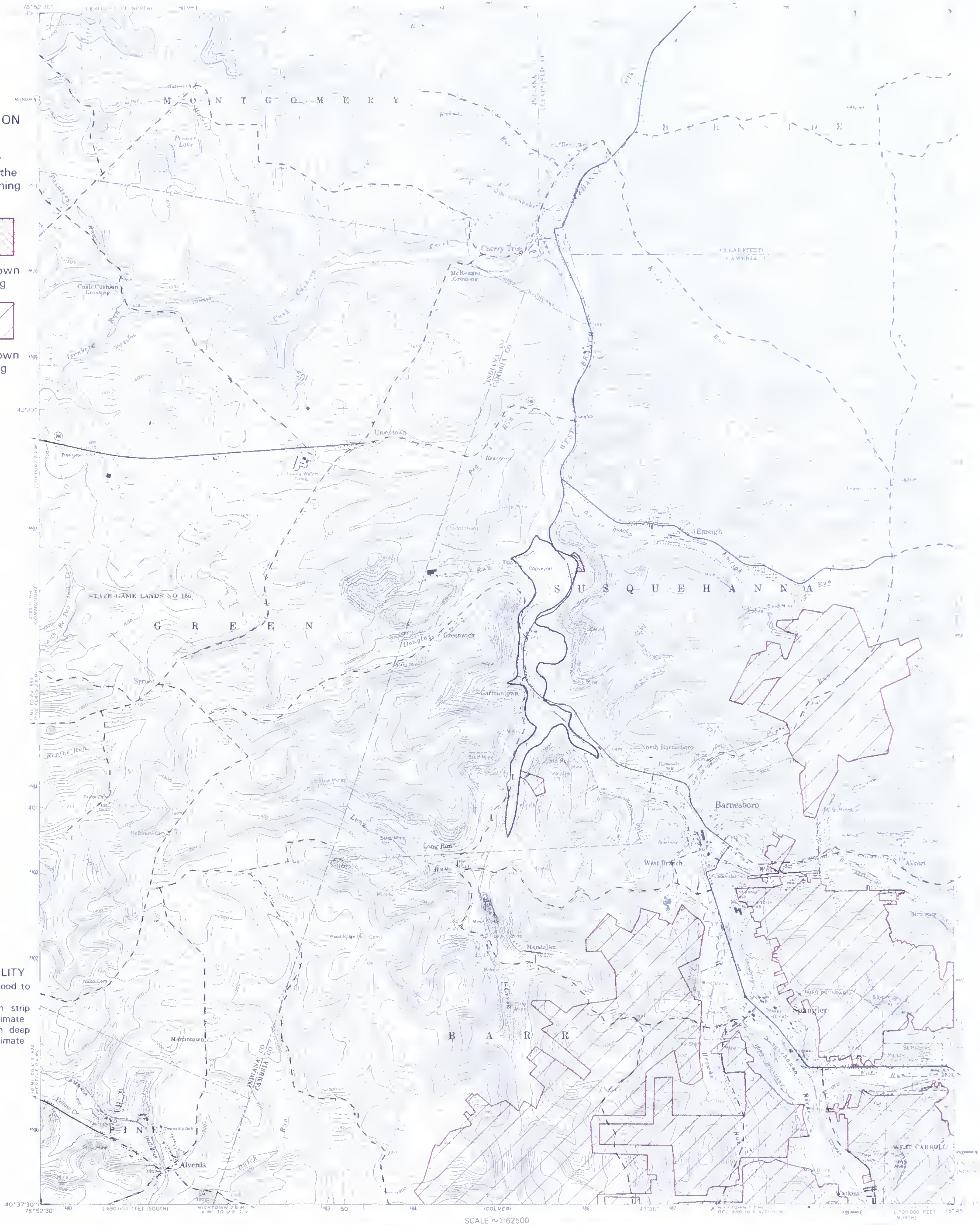
ASHVILLE

COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

- 〰 Crop line of the Lower Kittanning coal
- ▨ Extent of known strip mining
- ▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and location of strip mine on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

BARNESBORO

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

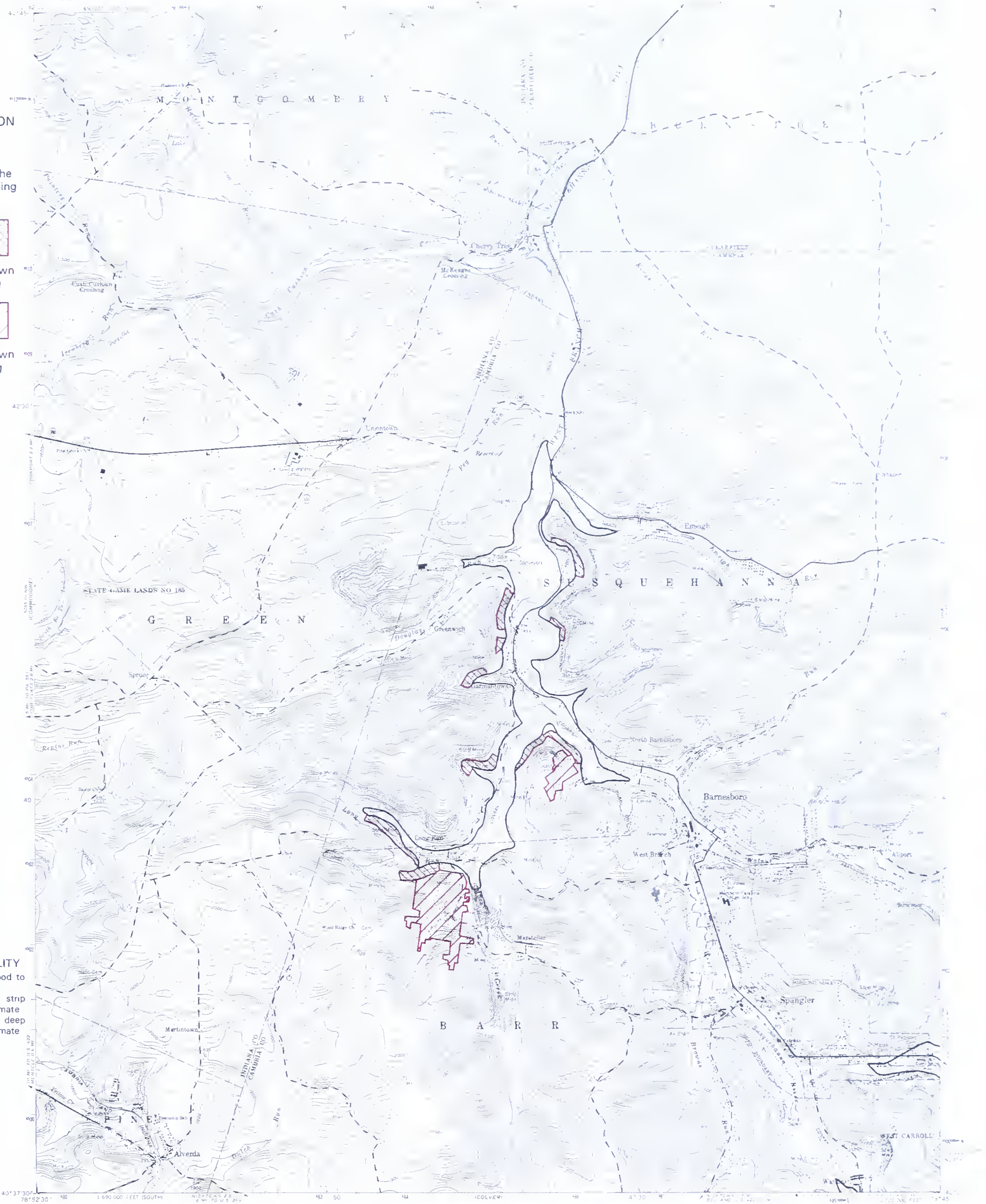
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line–good to very good
Limits of known strip mining–approximate
Limits of known deep mining–approximate

SOURCES

Crop line by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

BARNESBORO

CROP LINE AND MINED-OUT AREAS OF THE MIDDLE KITTANNING COAL

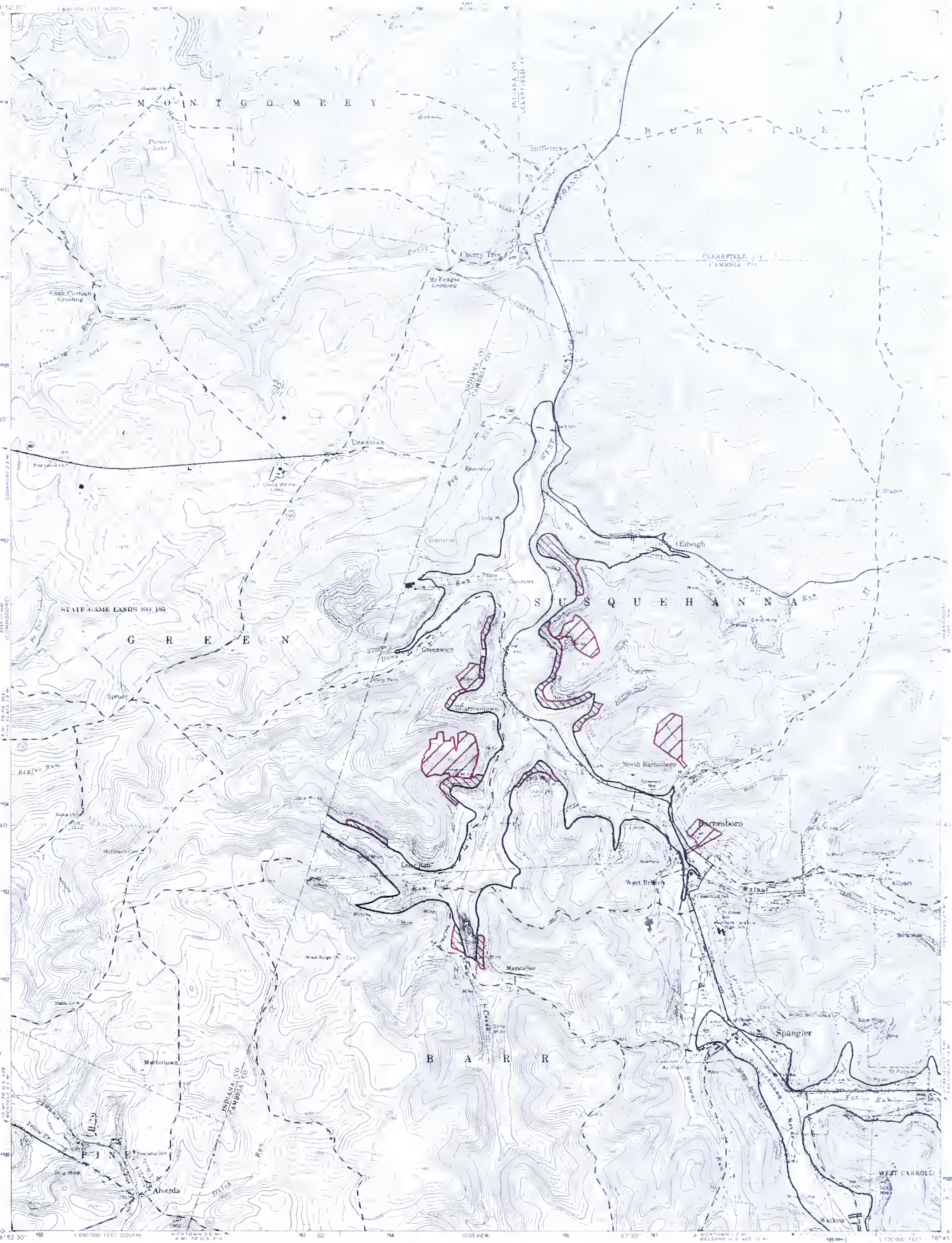
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

BARNESBORO

CROP LINE AND MINED-OUT AREAS OF THE
UPPER KITTANNING COAL

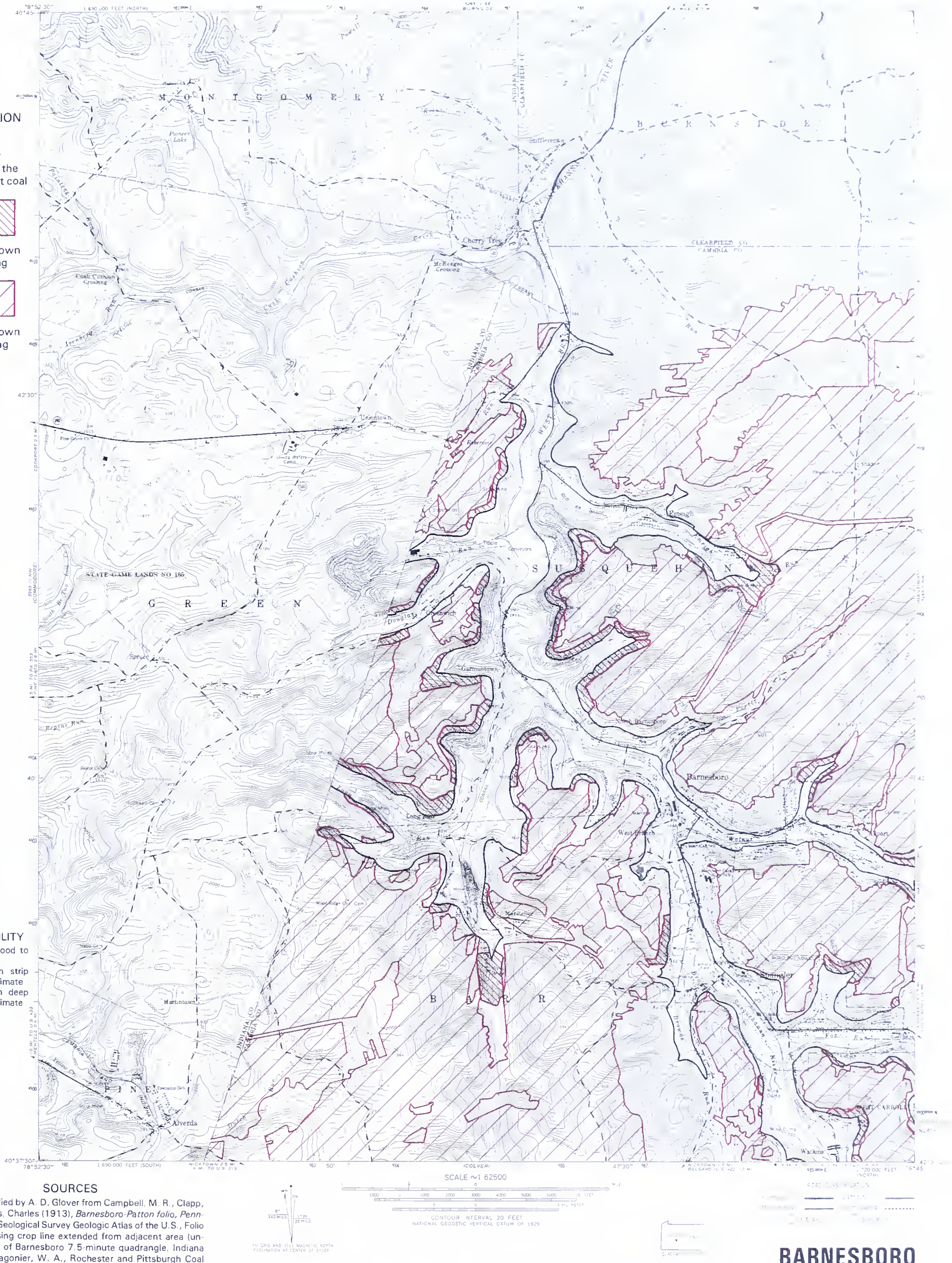
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Lower Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using crop line extended from adjacent area (unpublished map of Barnesboro 7.5-minute quadrangle, Indiana County, by Bragonier, W. A., Rochester and Pittsburgh Coal Company [1986]), unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map by Bragonier (1986).

CROP LINE AND MINED-OUT AREAS OF THE LOWER FREEPORT COAL

BARNESBORO

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Upper Freeport coal

▨ Extent of known strip mining

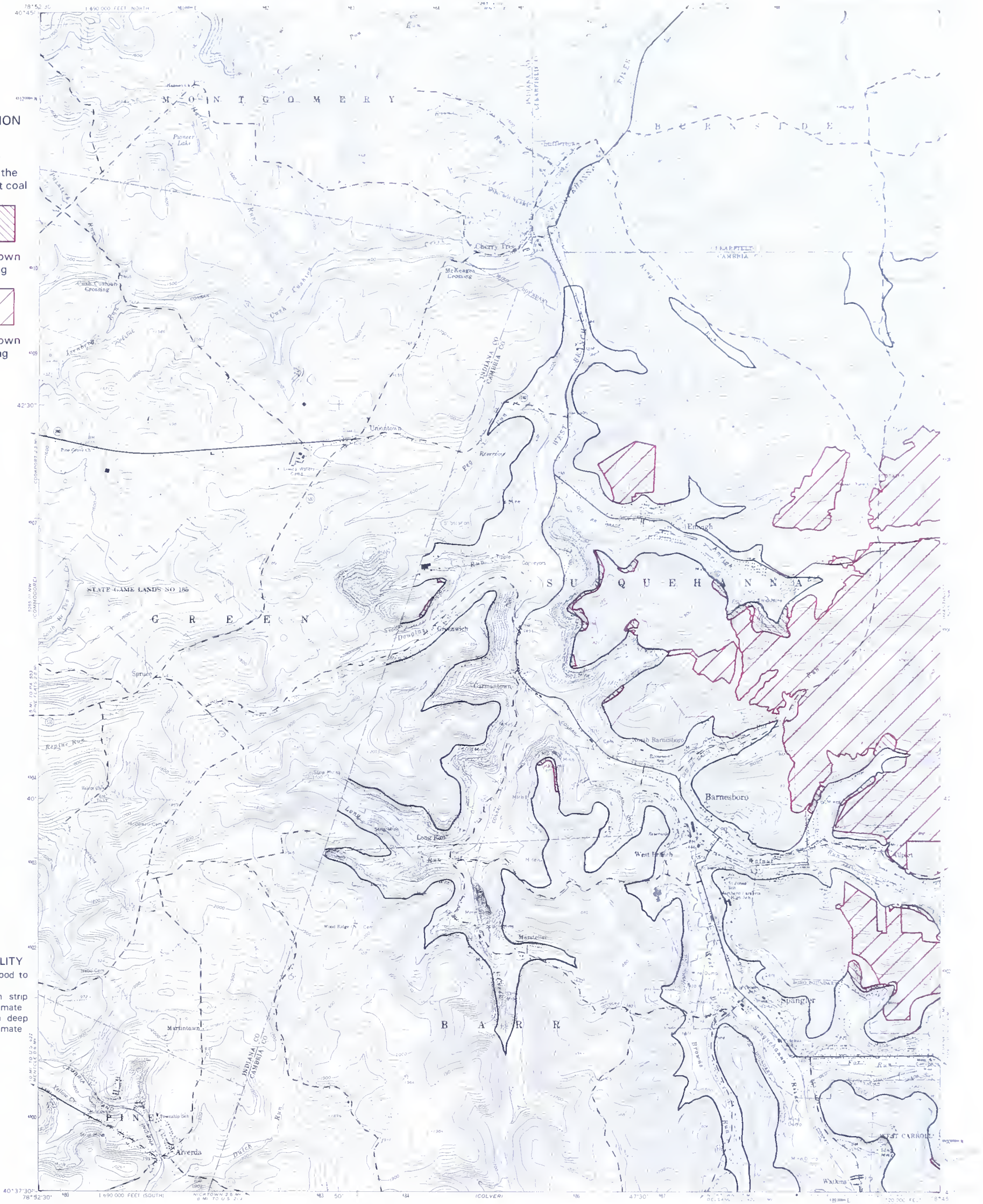
▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

BARNESBORO

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

—mh— Mahoning coal

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

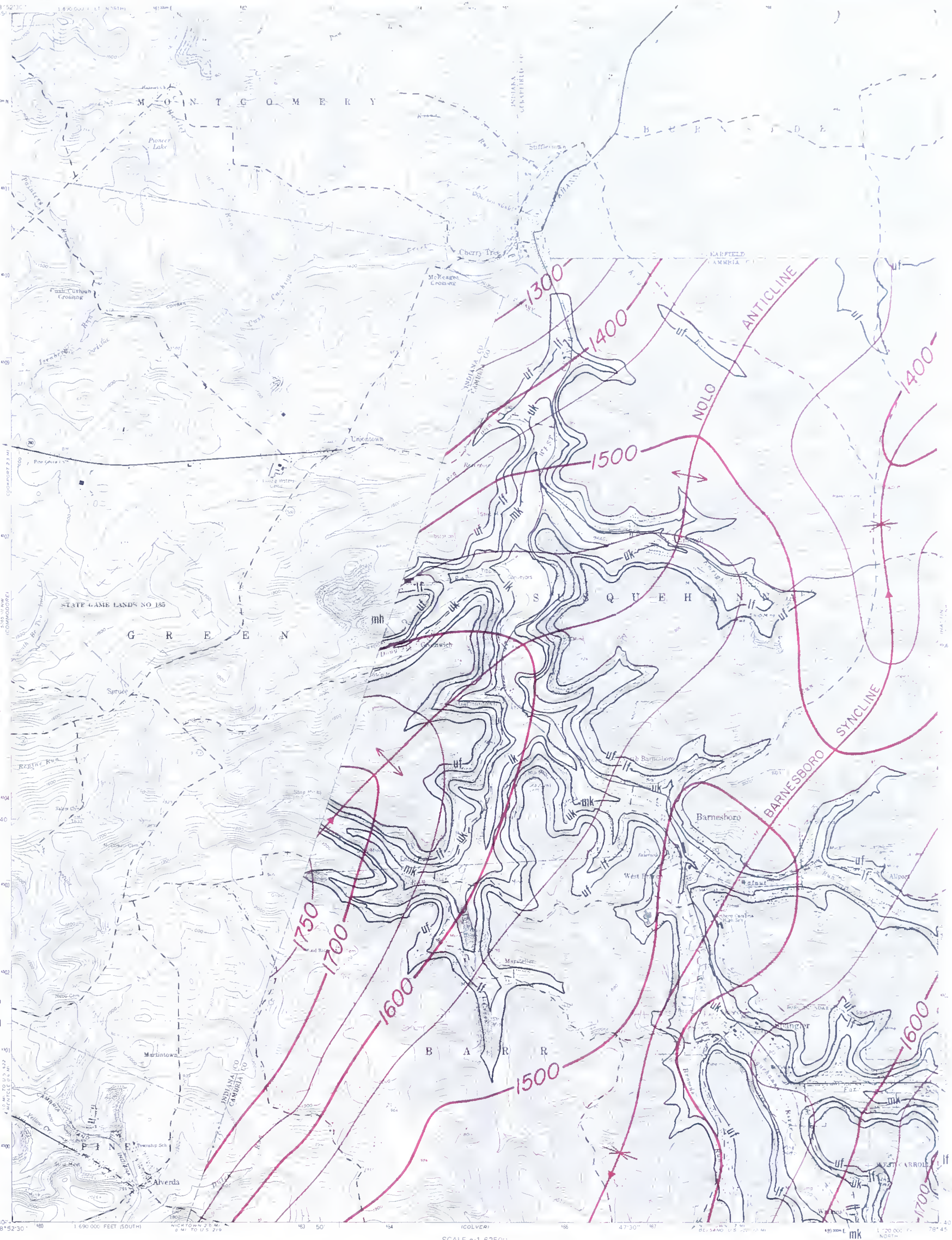
Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

—1500— Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines—good to very good
Structure contours—good to very good



SOURCES

Crop line of the Lower Freeport coal and structure contours modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using crop line and structure contours extended from adjacent area (unpublished maps of Barnesboro 7.5-minute quadrangle, Indiana County, by Bragonier, W. A., Rochester and Pittsburgh Coal Company [1986]), unpublished data, and locations of strip mines on topographic map.

Crop lines of the Middle Kittanning and Mahoning coals by A. D. Glover based on Campbell and others (1913), unpublished data, and locations of strip mines on topographic map.

Other crop lines modified by A. D. Glover from Campbell and others (1913) using unpublished data and/or locations of strip mines on topographic map.

BARNESBORO

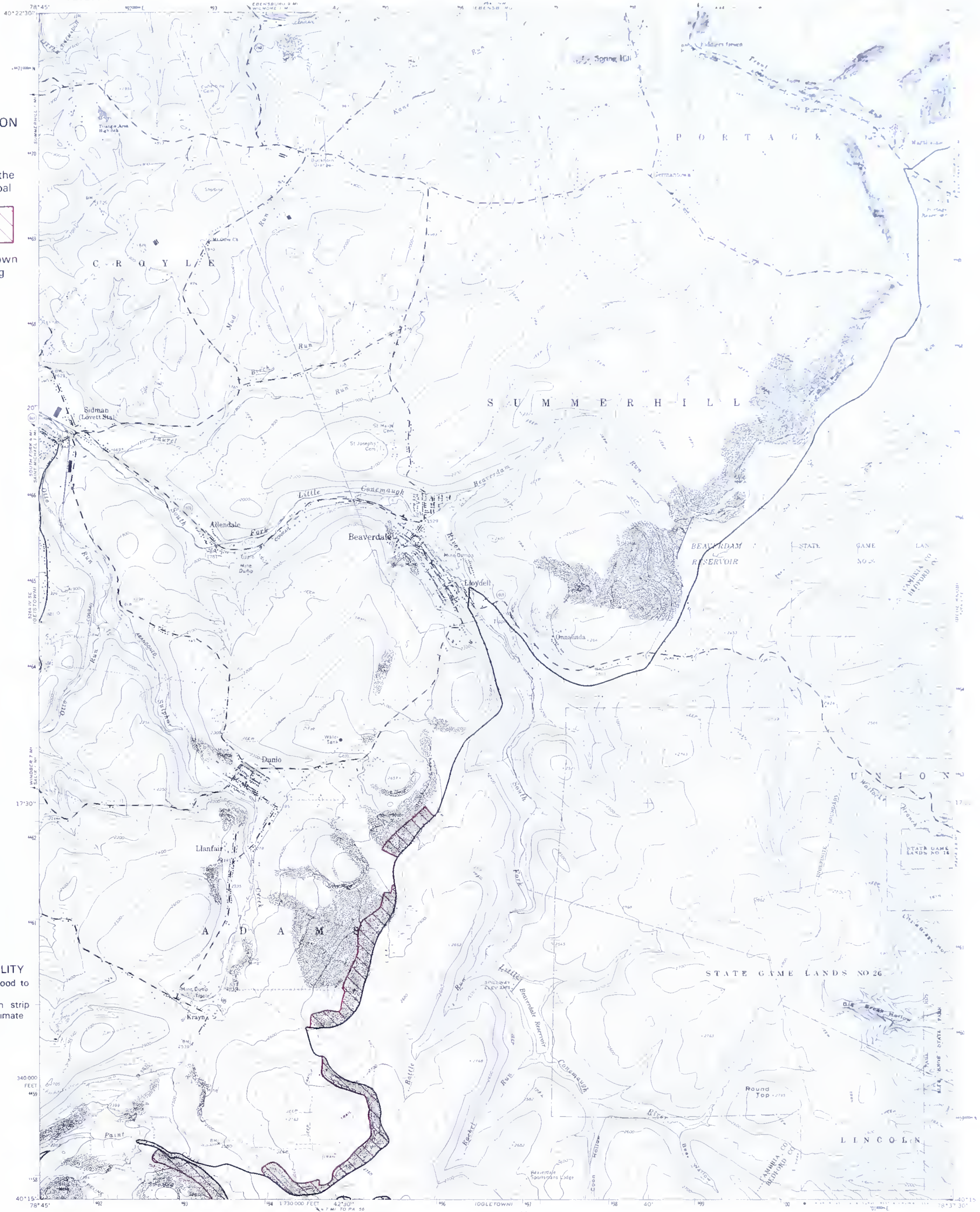
COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

～ Crop line of the Brookville coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

BEAVERDALE

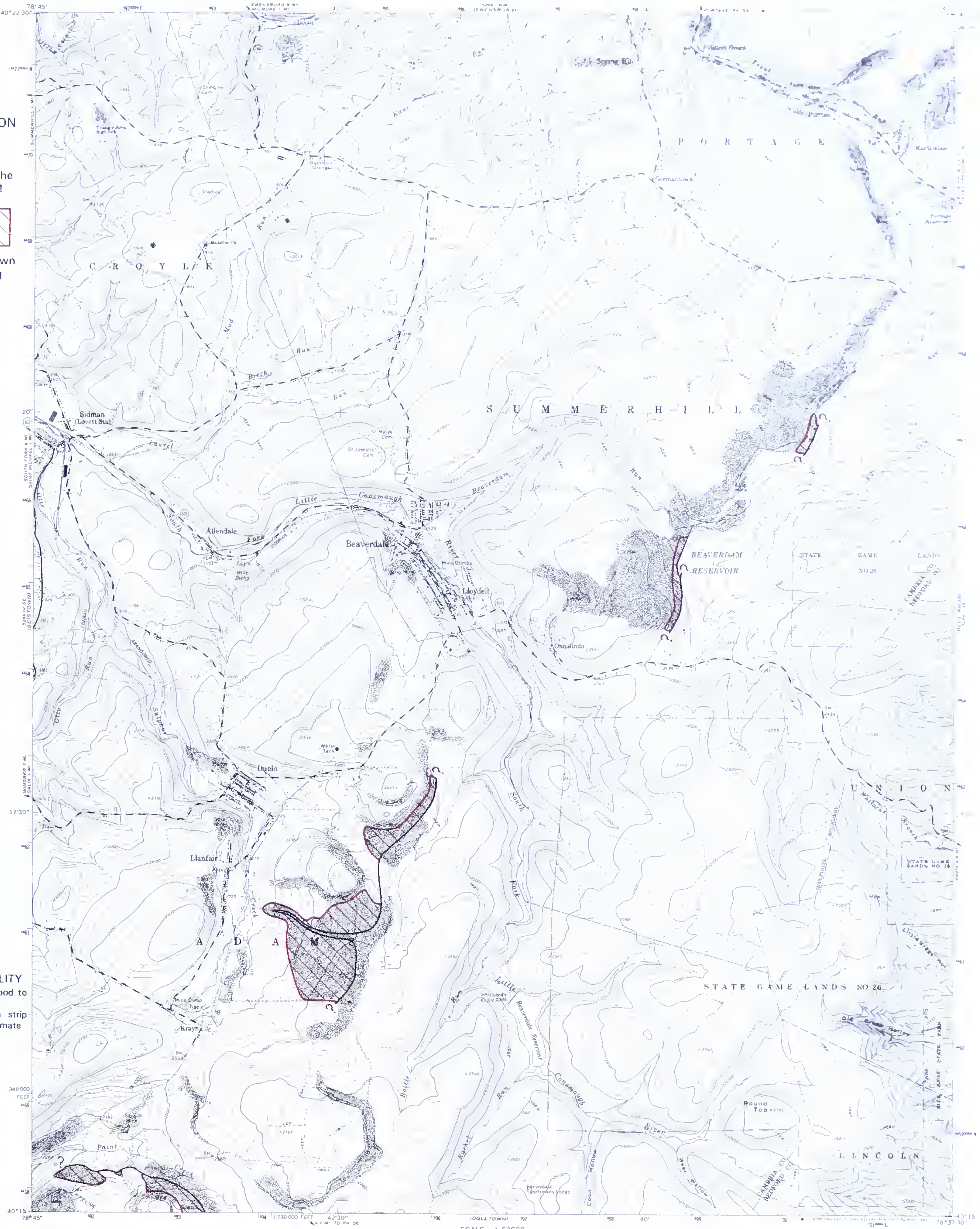
CROP LINE AND MINED-OUT AREAS OF THE
BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Clarion coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

ROAD CLASSIFICATION
Medium duty — Light duty
Unimproved dirt
State Route

PENNSYLVANIA
QUADRANGLE LOCATION

BEAVERDALE

CROP LINE AND MINED-OUT AREAS OF THE CLARION COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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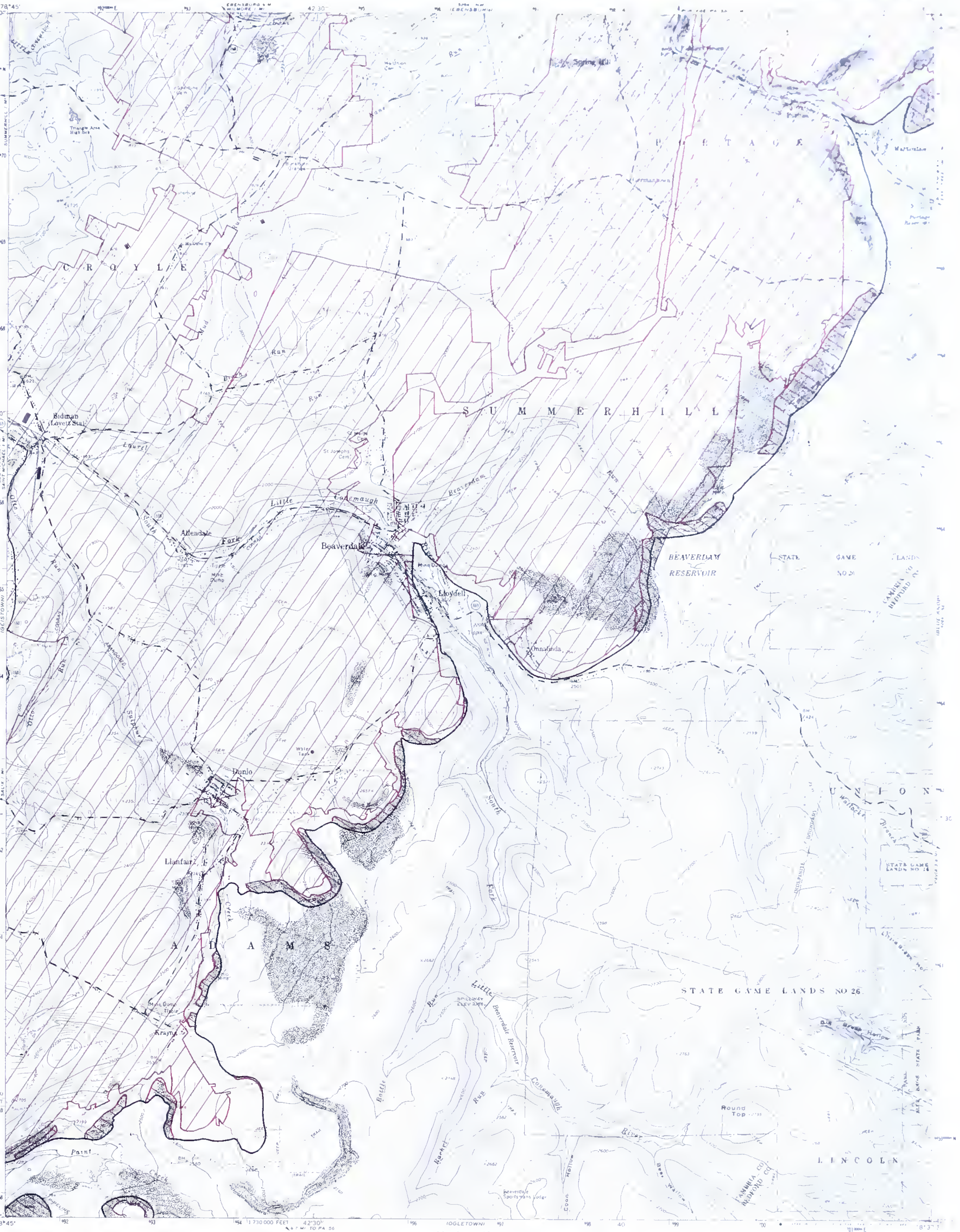
EXPLANATION

Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▭ Extent of known deep mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION
Medium duty —— Light duty
Unimproved dirt
State Route

PENNSYLVANIA
QUADRANGLE LOCATION

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CROP LINE AND MINED-OUT AREAS OF THE LOWER KITTANNING COAL

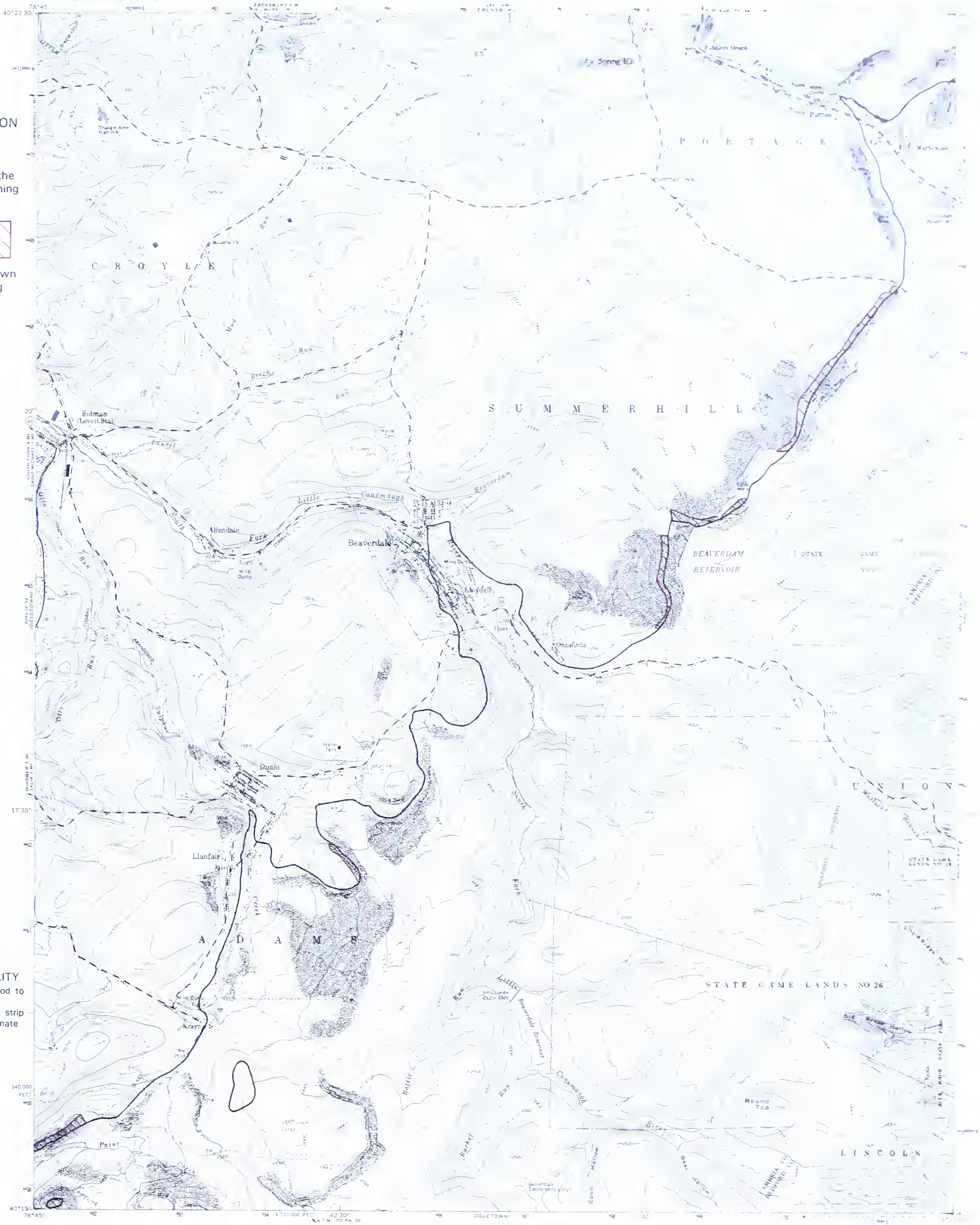
BEAVERDALE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1961 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

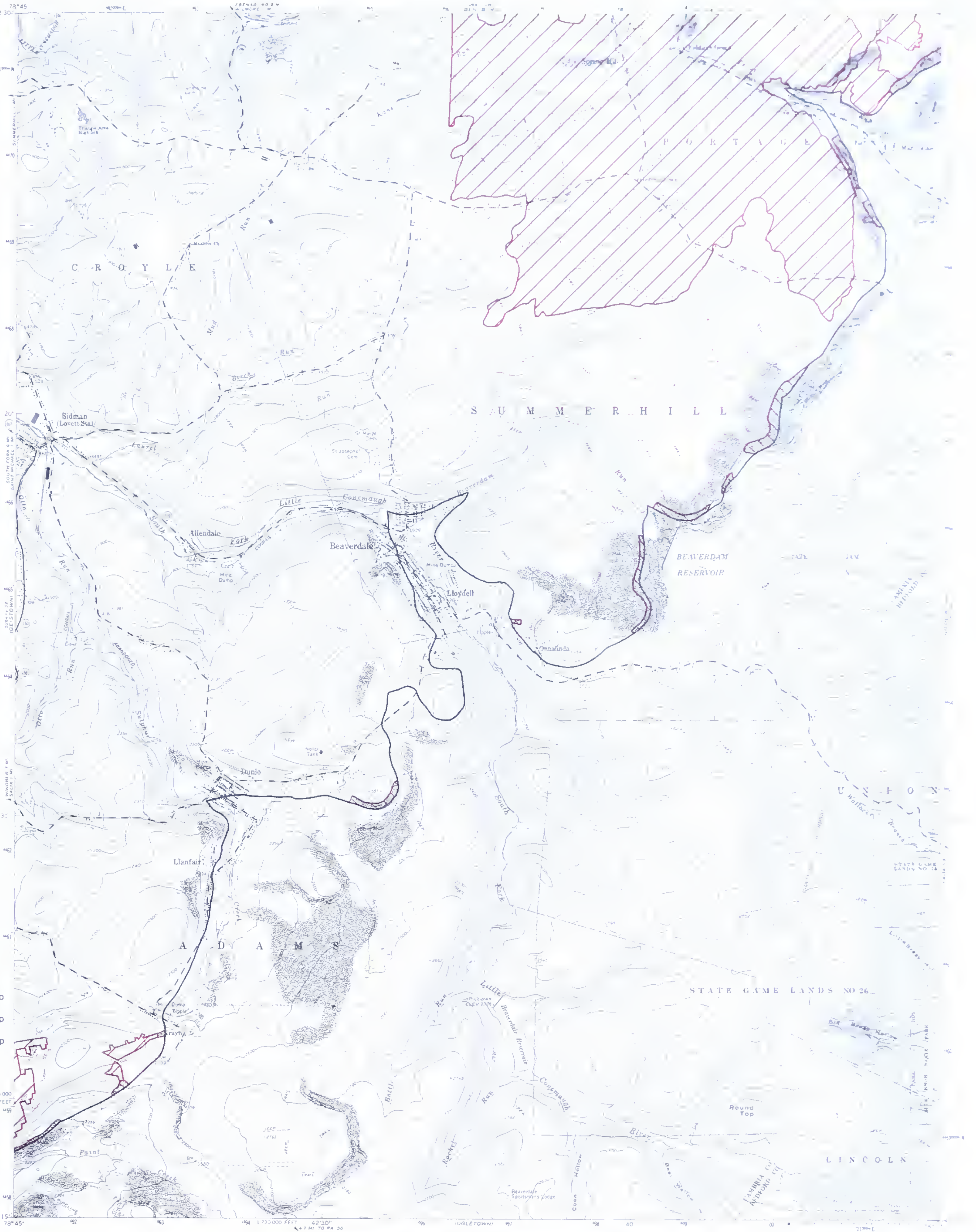
Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

BEAVERDALE

CROP LINE AND MINED-OUT AREAS OF THE MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

〰 Crop line of the Upper Kittanning coal

▧ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

BEAVERDALE

CROP LINE AND MINED-OUT AREAS OF THE UPPER KITTANNING COAL

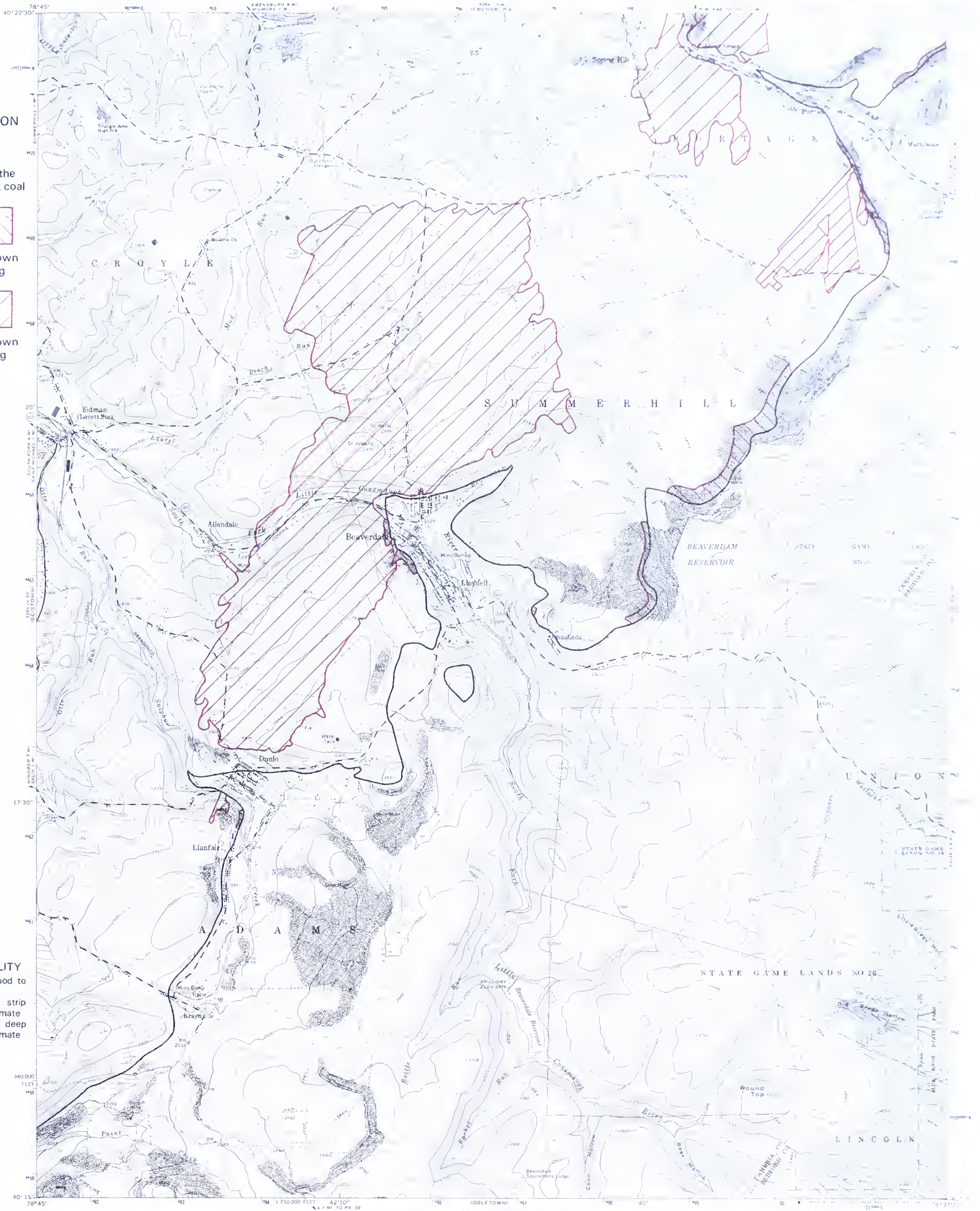
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Freeport coal

▧ Extent of known strip mining

▨ Extent of known deep mining



SCALE ~1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

BEAVERDALE

CROP LINE AND MINED-OUT AREAS OF THE LOWER FREEPORT COAL

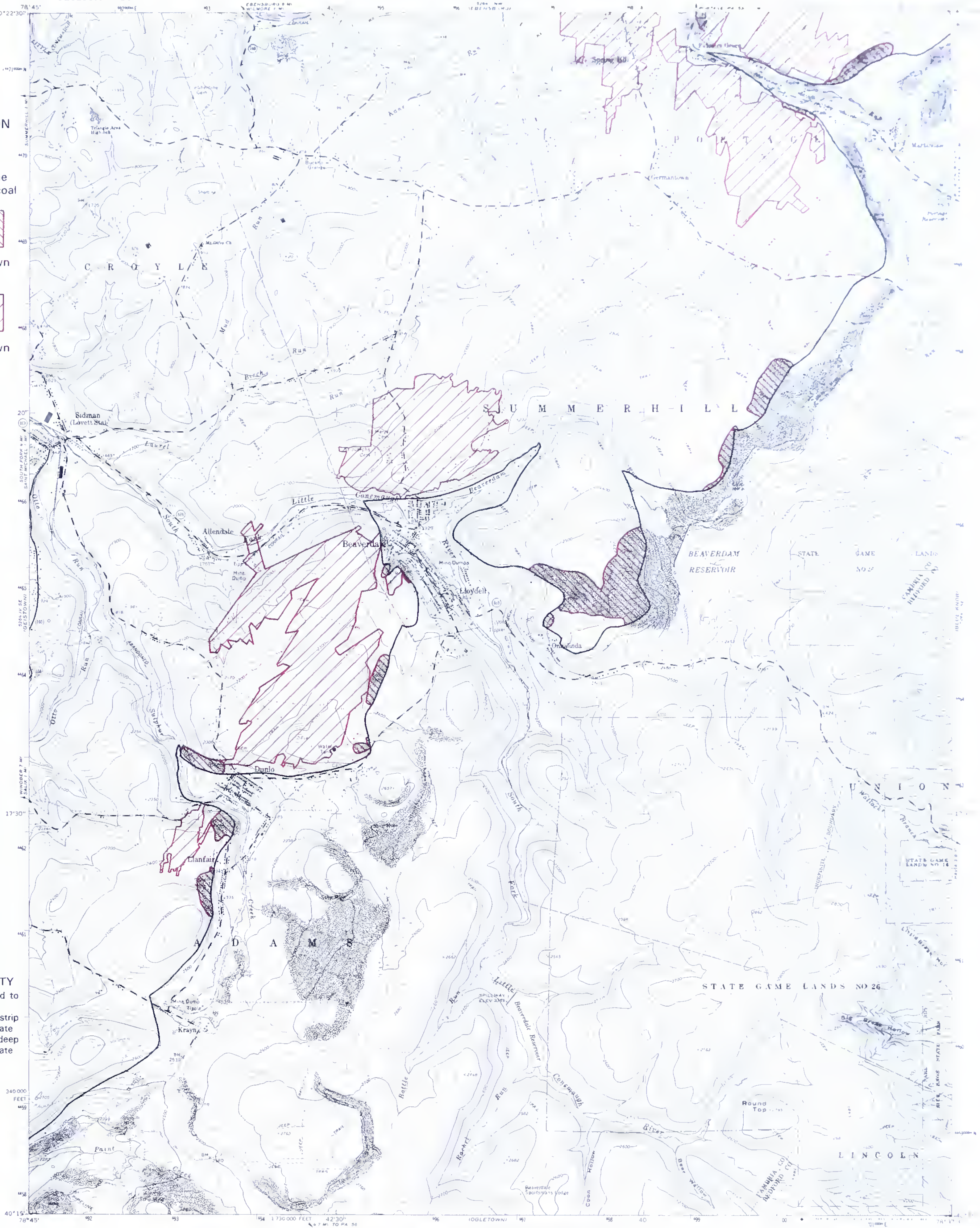
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Upper Freeport coal

▧ Extent of known strip mining

▨ Extent of known deep mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION
Medium-duty Light-duty
Unimproved dirt
State Route

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

BEAVERDALE

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BEAVERDALE QUADRANGLE
PENNSYLVANIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

EXPLANATION

CROP LINES

—l— Lonaconing coal

—lb— Lower Bakerstown coal

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—cl— Clarion coal

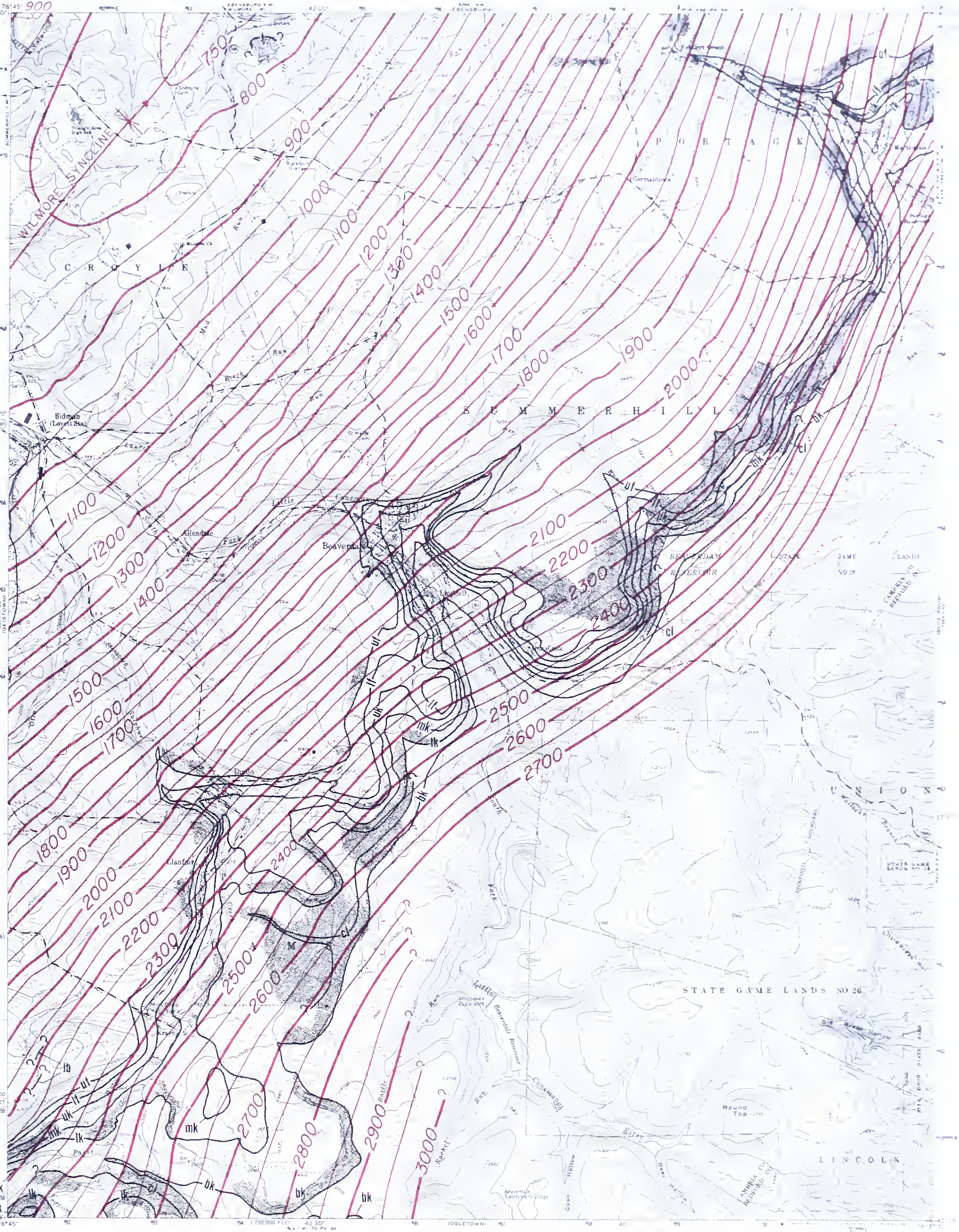
—bk— Brookville coal

—➤—✳— Syncline
Showing axial-plane trace and direction of plunge.

—2000— Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good



SCALE 1 62500

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0 1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SOURCES

Crop lines of the Clarion, Middle Kittanning, Lower Freeport, Lower Bakerstown, and Lonaconing coals by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map.

Other crop lines and structure contours modified by A. D. Glover from Butts (1905) using unpublished data and locations of strip mines on topographic map.

COAL CROP LINES AND STRUCTURE CONTOURS

BEAVERDALE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

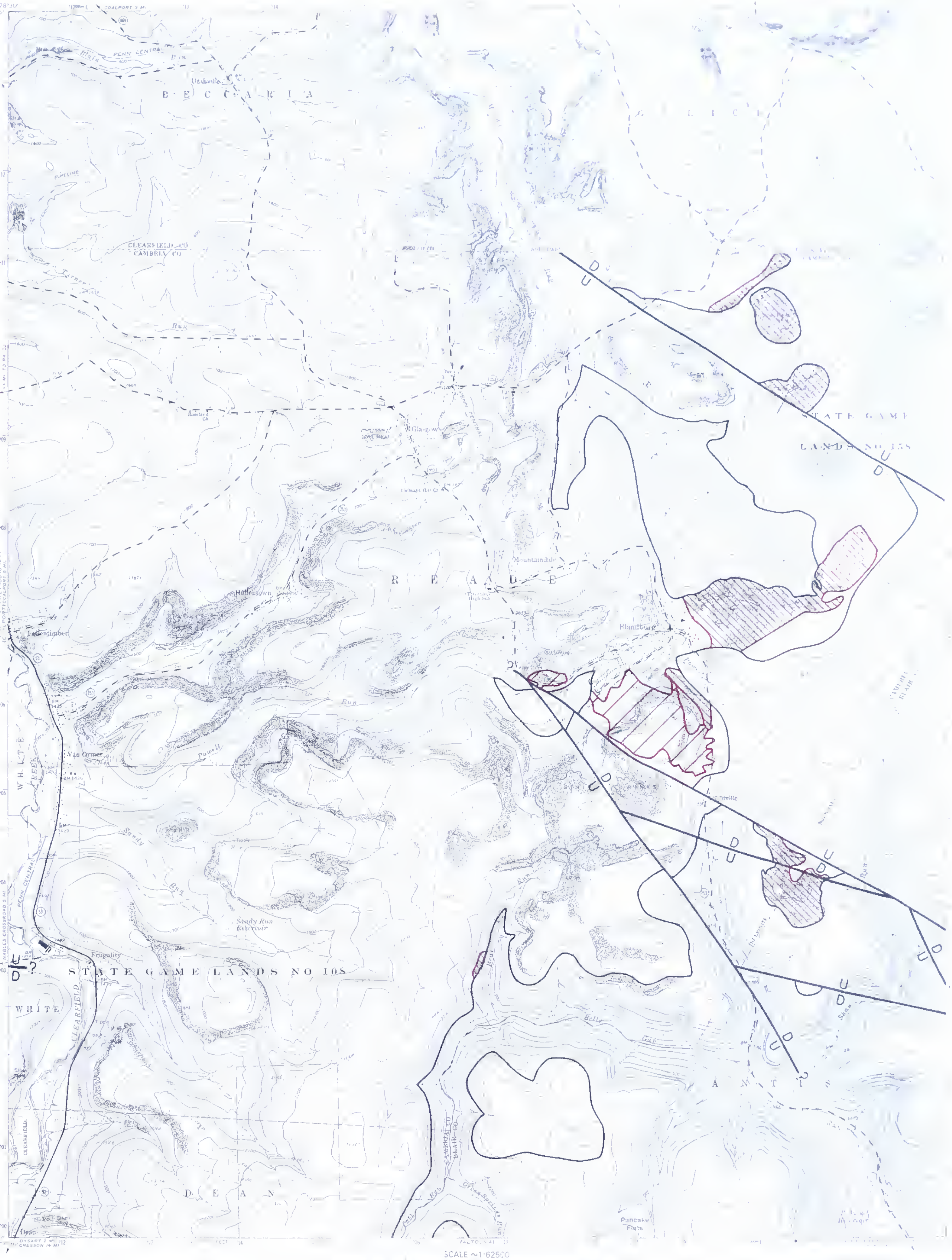
EXPLANATION

∼ Crop line of the Brookville coal

▨ Extent of known strip mining

▨ Extent of known deep mining

D/U Wrench fault
U, upthrown side; D, downthrown side.



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.

Limits of strip mining based on interpretation of topographic map and unpublished data.

Limits of deep mining from unpublished data.

Positions of wrench faults compiled by A. D. Glover from Faill and others (1989, in press) and unpublished data.

BLANDBURG

CROP LINE AND MINED-OUT AREAS OF THE BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

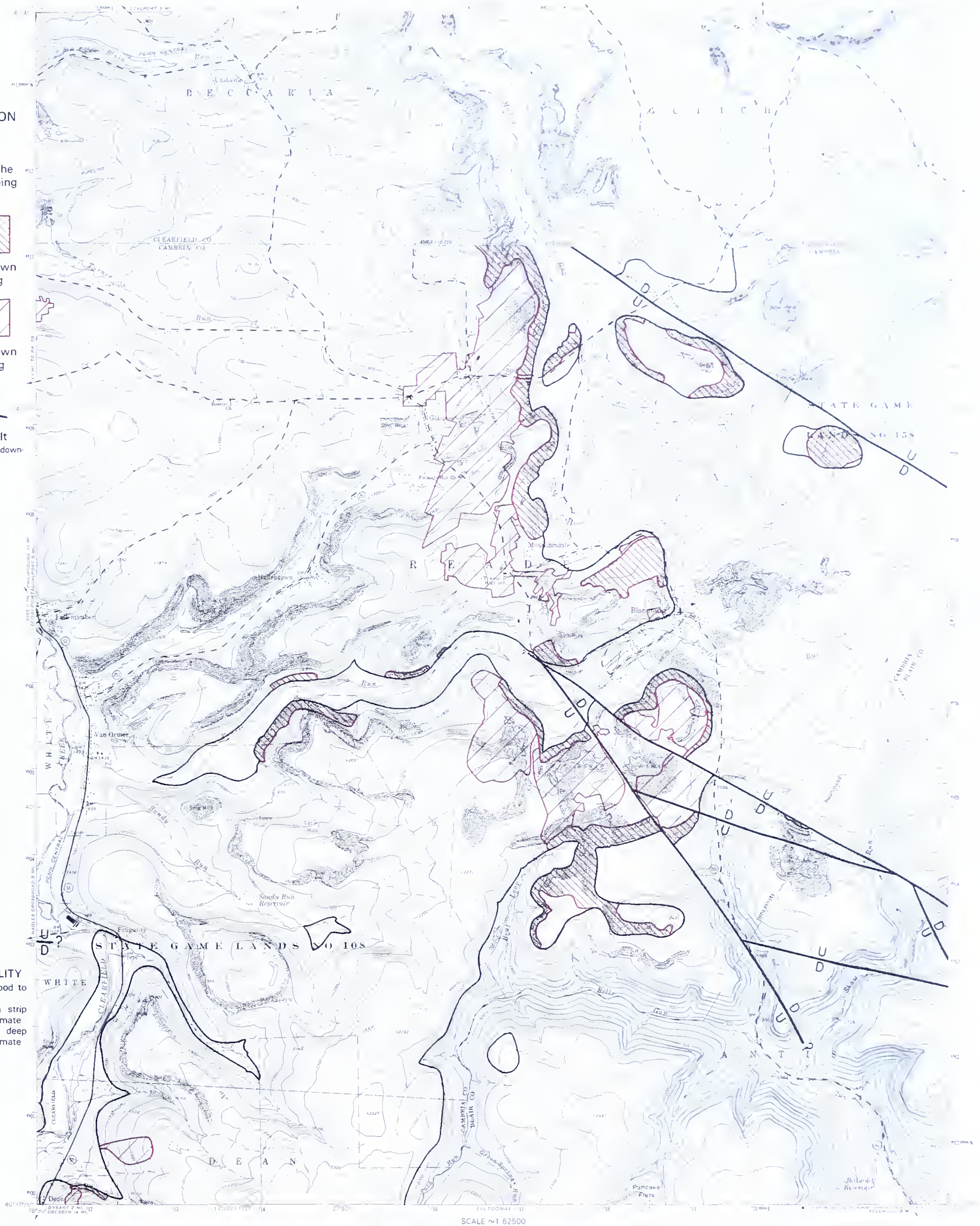
EXPLANATION

〜 Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

D/U Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

SOURCES

Crop line from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.

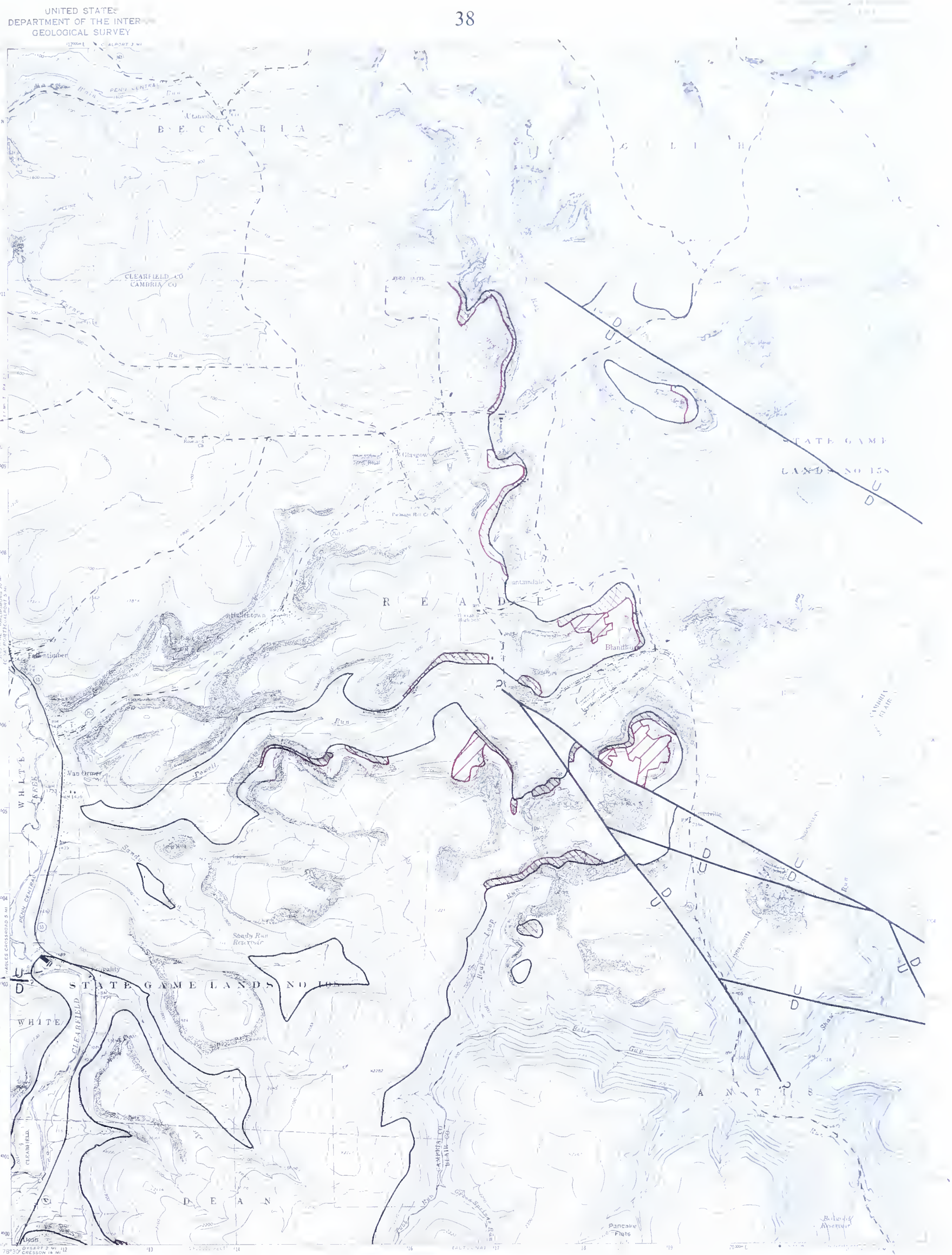
Limits of strip mining based on interpretation of topographic map and unpublished data.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

Positions of wrench faults compiled by A. D. Glover from Faill and others (1989, in press) and unpublished data.

BLANDBURG

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL



EXPLANATION

Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

Wrench fault
U, upthrown side; D, downthrown side.

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania,* Pennsylvania Geological Survey, 4th ser., Atlas 86.

Limits of strip mining based on interpretation of topographic map and unpublished data.

Limits of deep mining from unpublished mine map.

Positions of wrench faults compiled by A. D. Glover from Faill and others (1989, in press) and unpublished data.

BLANDBURG

CROP LINE AND MINED-OUT AREAS OF THE
MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

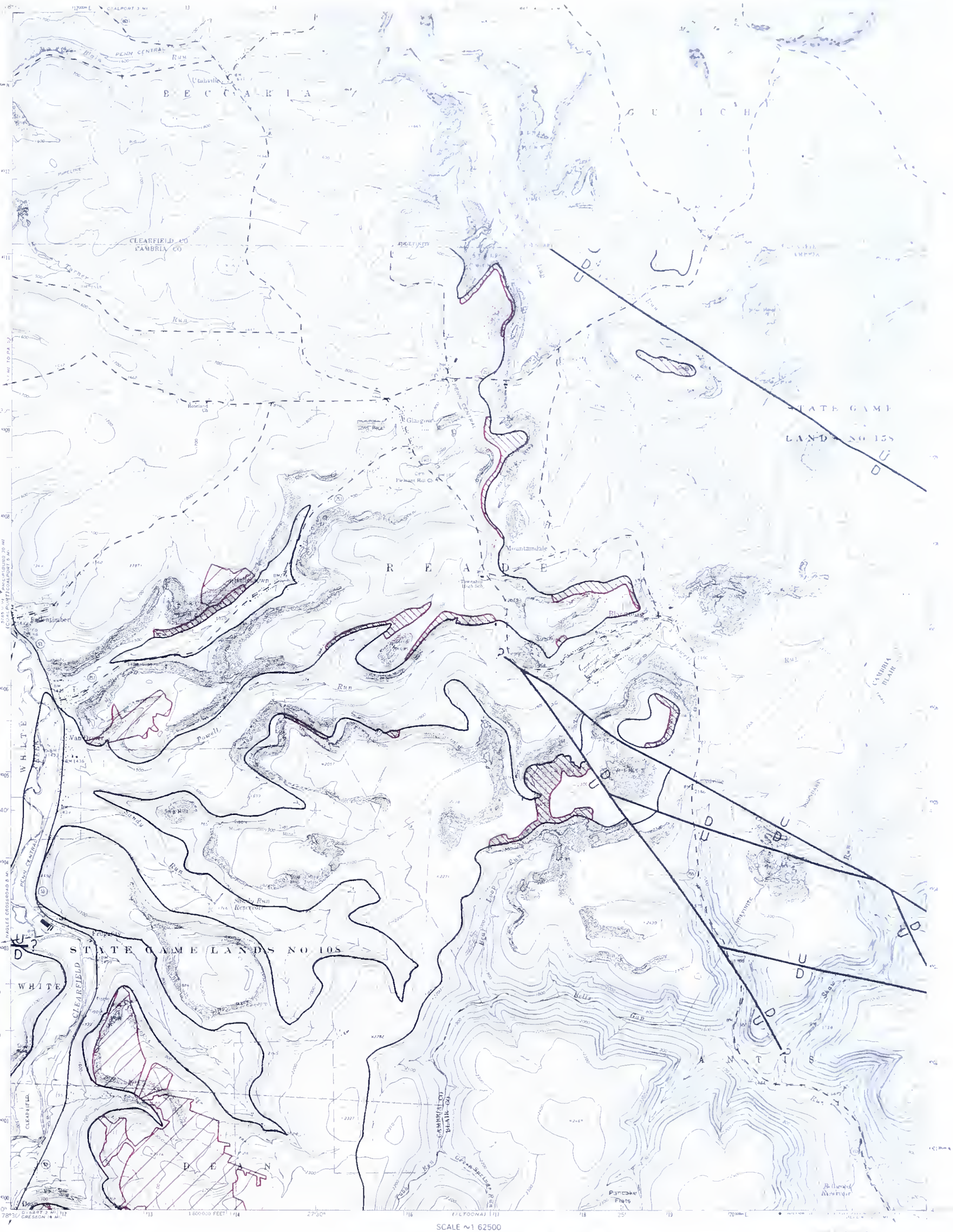
EXPLANATION

Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.

Limits of strip mining based on interpretation of topographic map and unpublished data.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

Positions of wrench faults compiled by A. D. Glover from Faill and others (1989, in press) and unpublished data.

BLANDBURG

CROP LINE AND MINED-OUT AREAS OF THE
UPPER KITTANNING COAL

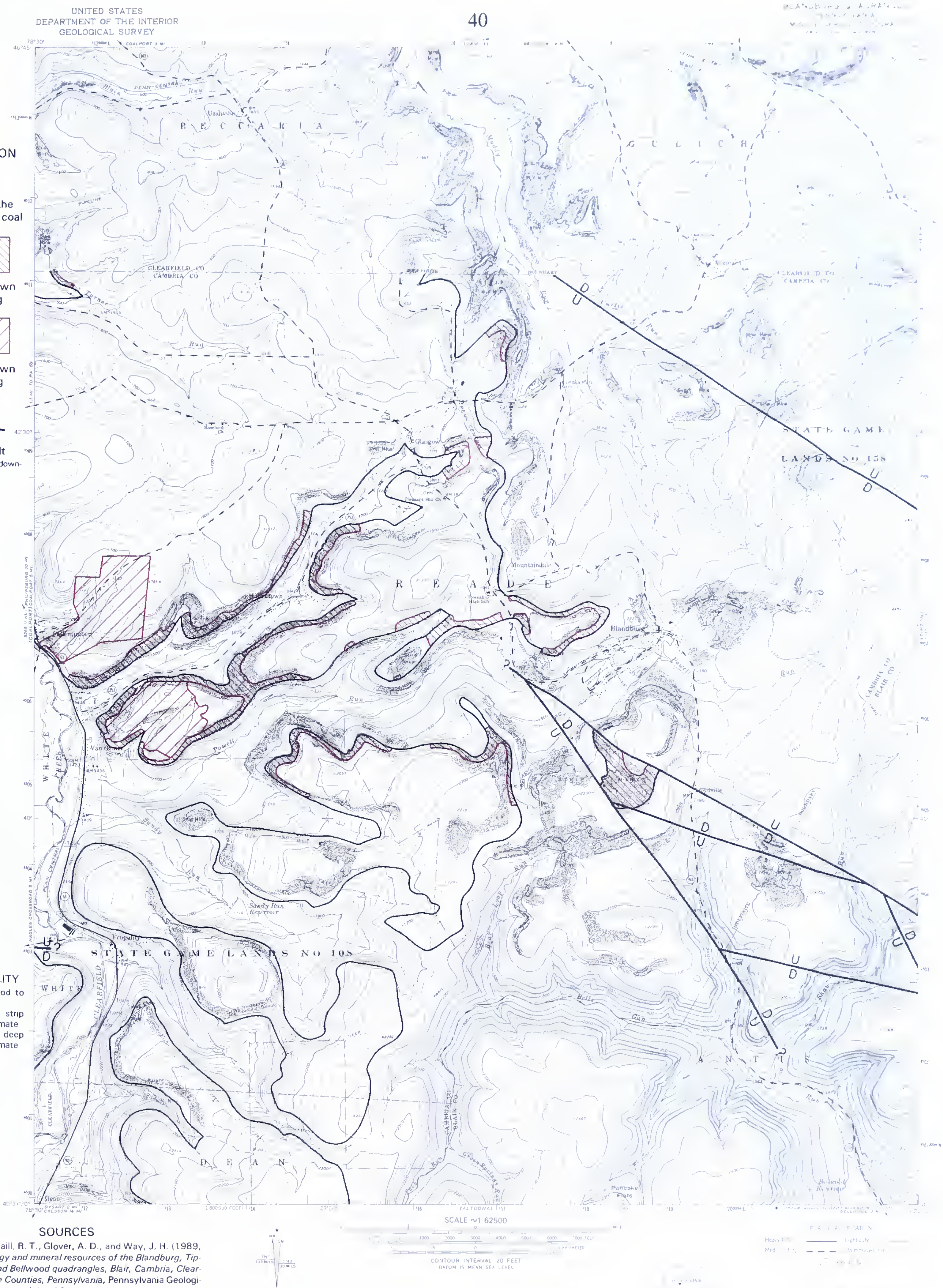
EXPLANATION

Crop line of the Lower Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining

Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86.
Limits of strip mining based on interpretation of topographic map and unpublished data.
Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.
Positions of wrench faults compiled by A. D. Glover from Faill and others (1989, in press) and unpublished data.

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

BLANDBURG

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

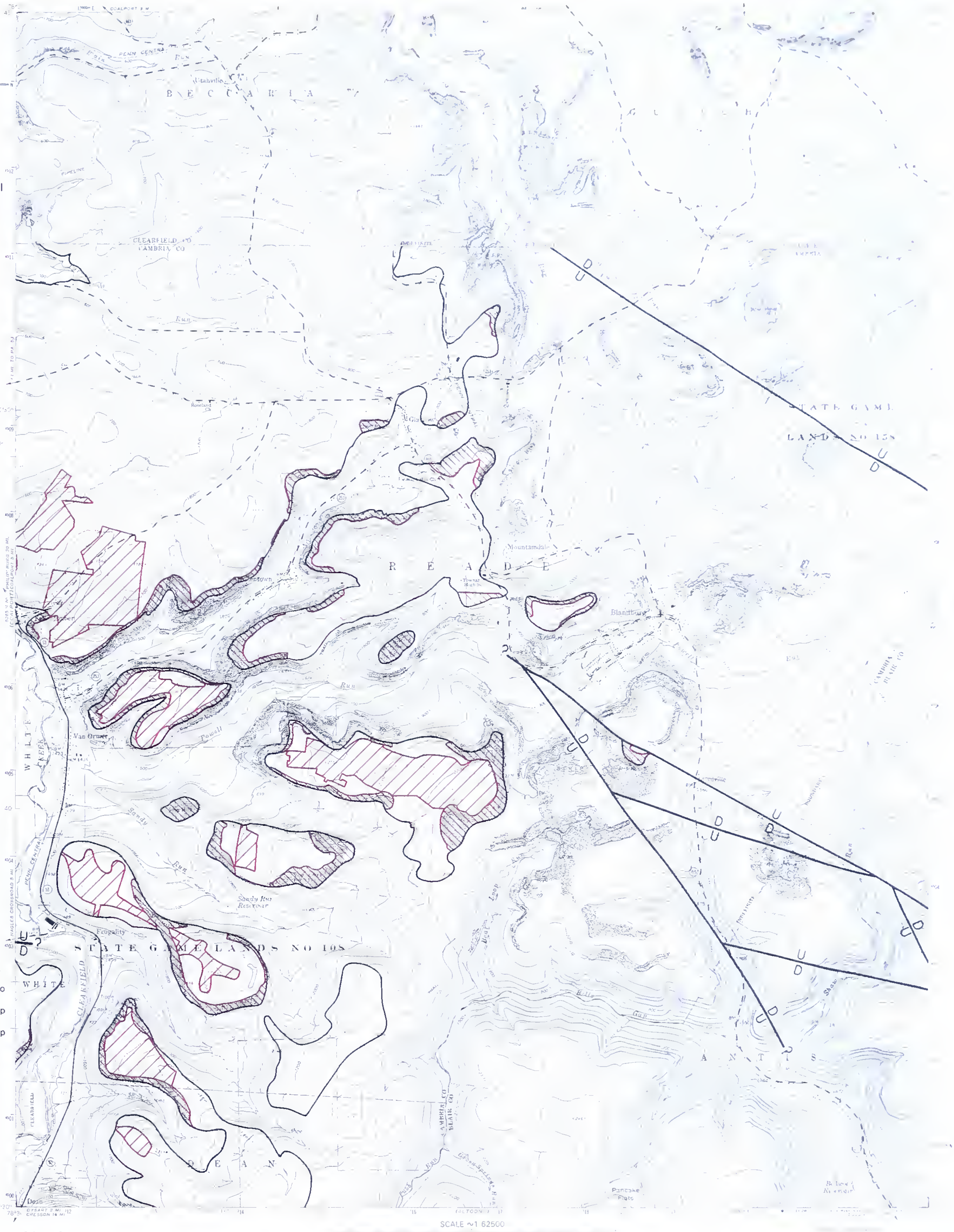
EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining

Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania,* Pennsylvania Geological Survey, 4th ser., Atlas 86.

Limits of strip mining based on interpretation of topographic map and unpublished data.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

Positions of wrench faults compiled by A. D. Glover from Faill and others (1989, in press) and unpublished data.

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

BLANDBURG

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—cl— Clarion coal

—bk— Brookville coal

Syncline
Showing axial-plane trace and direction of plunge.

—*2500*—

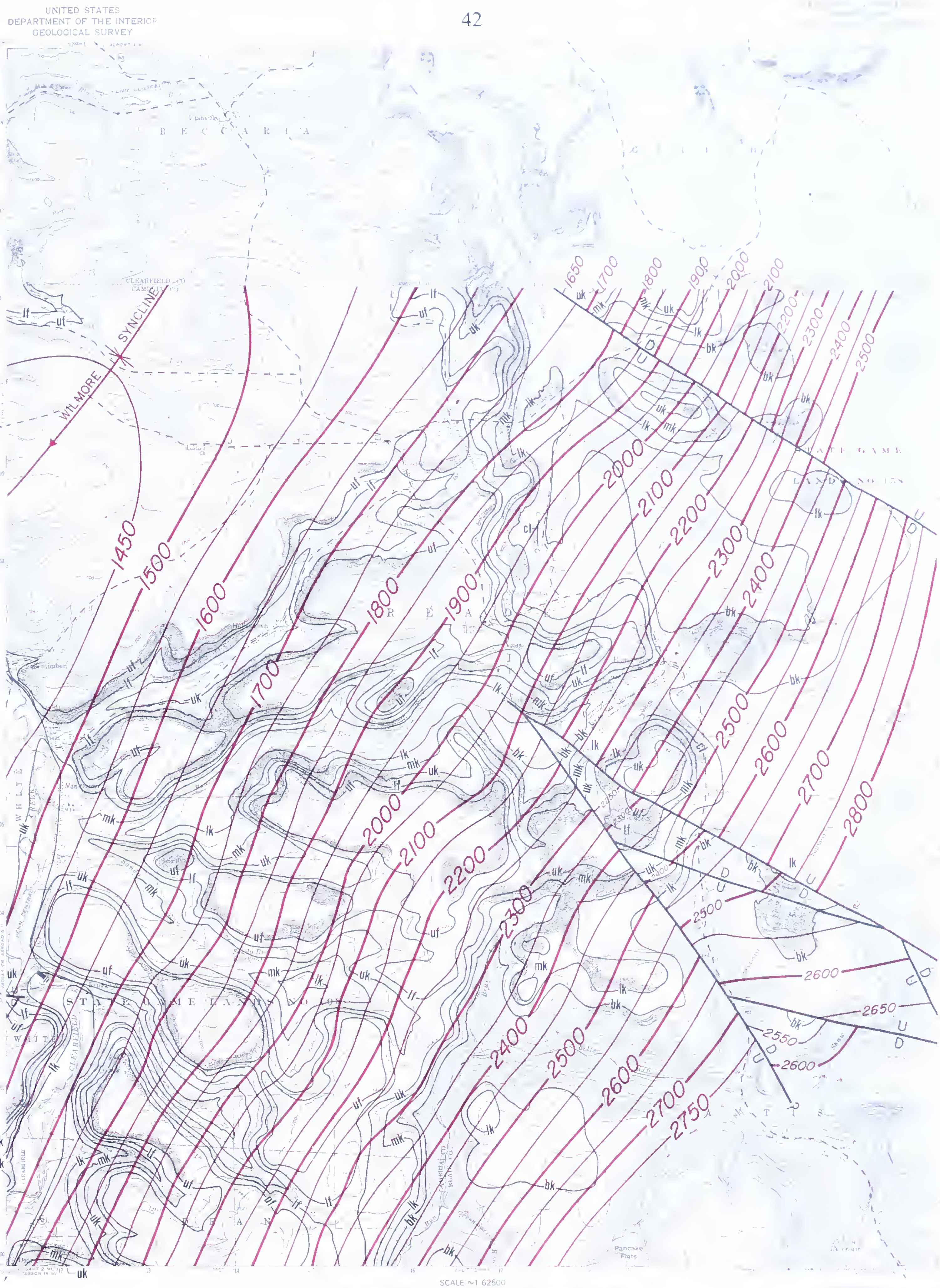
Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.

D/U

Wrench fault
U, upthrown side; D, downthrown side.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good



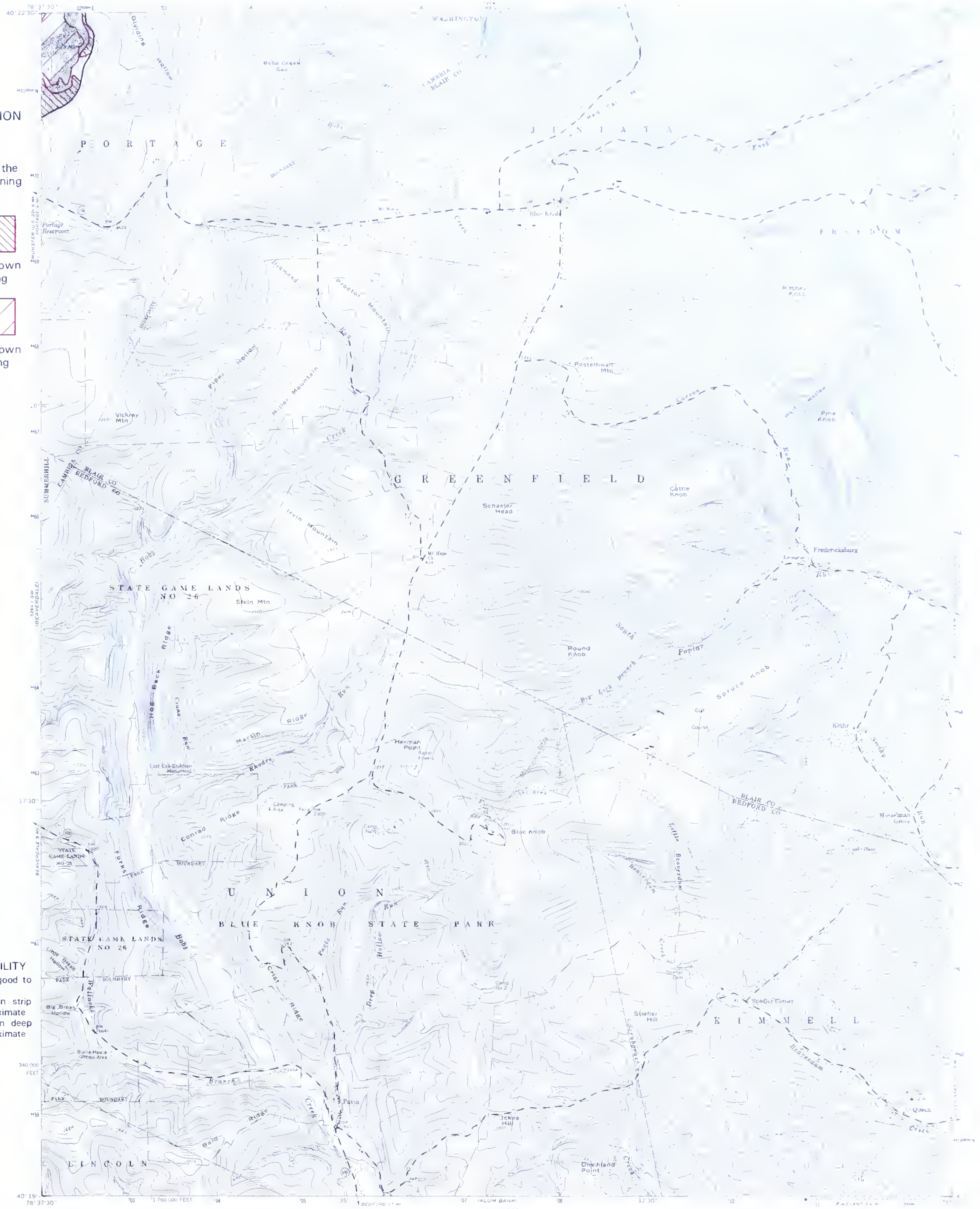
SOURCES

Crop lines and structure contours from Faill, R. T., Glover, A. D., and Way, J. H. (1989, in press), *Geology and mineral resources of the Blandburg, Tipton, Altoona, and Bellwood quadrangles, Blair, Cambria, Clearfield, and Centre Counties, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 86. Positions of wrench faults compiled by A. D. Glover from Faill and others (1989, in press) and unpublished data.

BLANDBURG

COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

EXPLANATION

Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

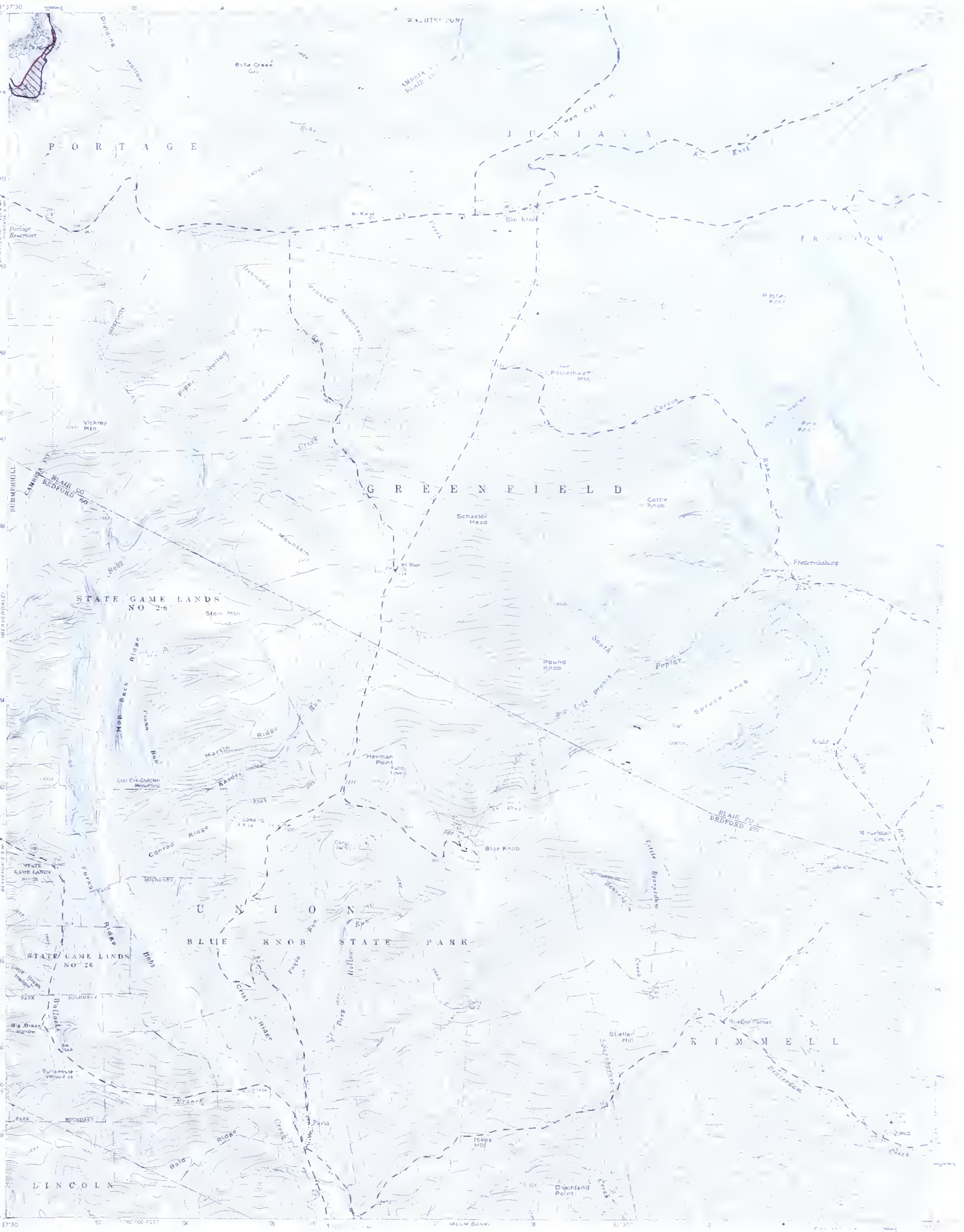
SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.
Limits of deep mining from unpublished mine map.

BLUE KNOB

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

EXPLANATION

Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

BLUE KNOB

CROP LINE AND MINED-OUT AREAS OF THE MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BLUE KNOB QUADRANGLE
PENNSYLVANIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

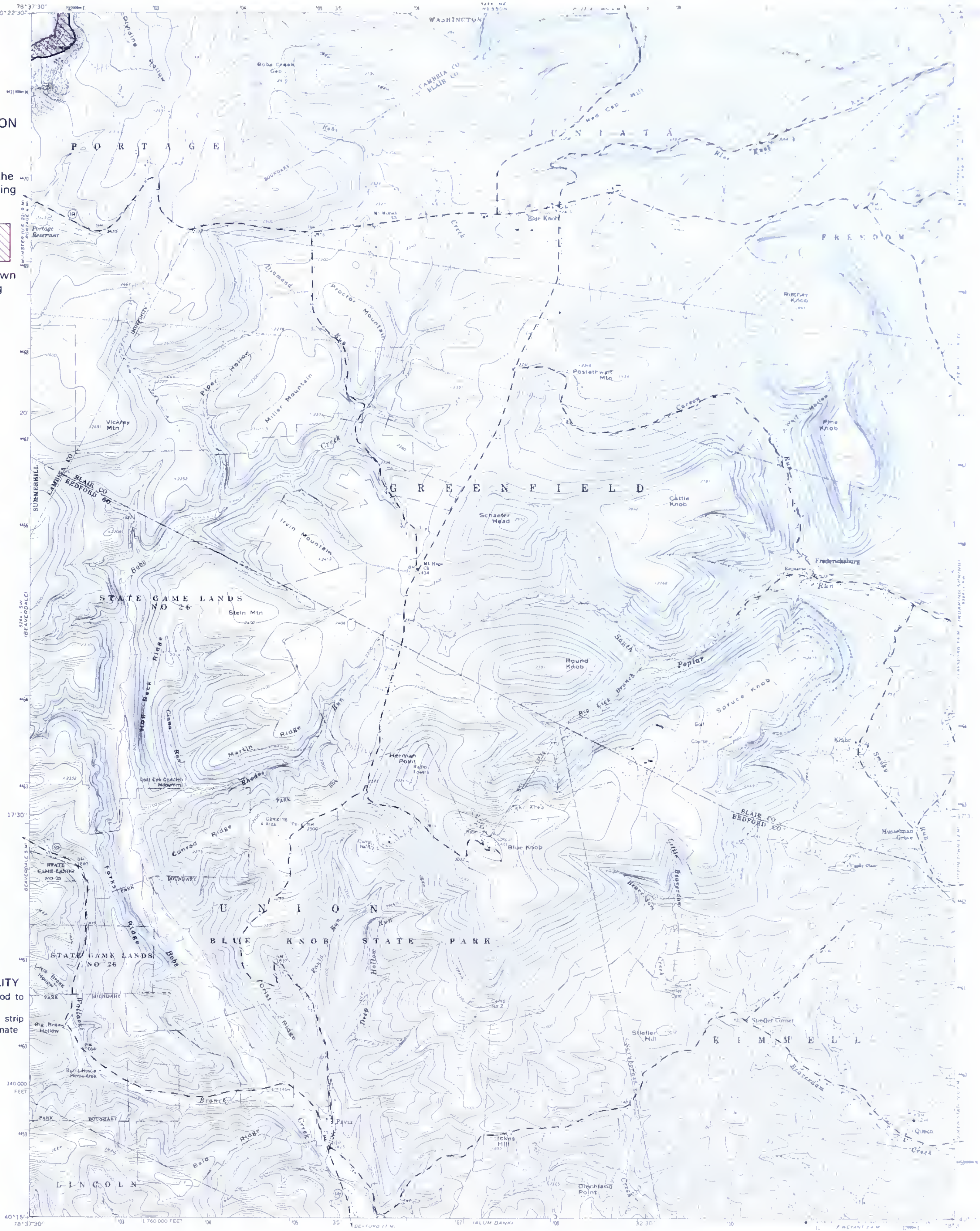
EXPLANATION

Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate



SCALE ~1 62500

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

ROAD CLASSIFICATION

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and location of strip mine on topographic map.
Limits of strip mining based on interpretation of topographic map.

BLUE KNOB

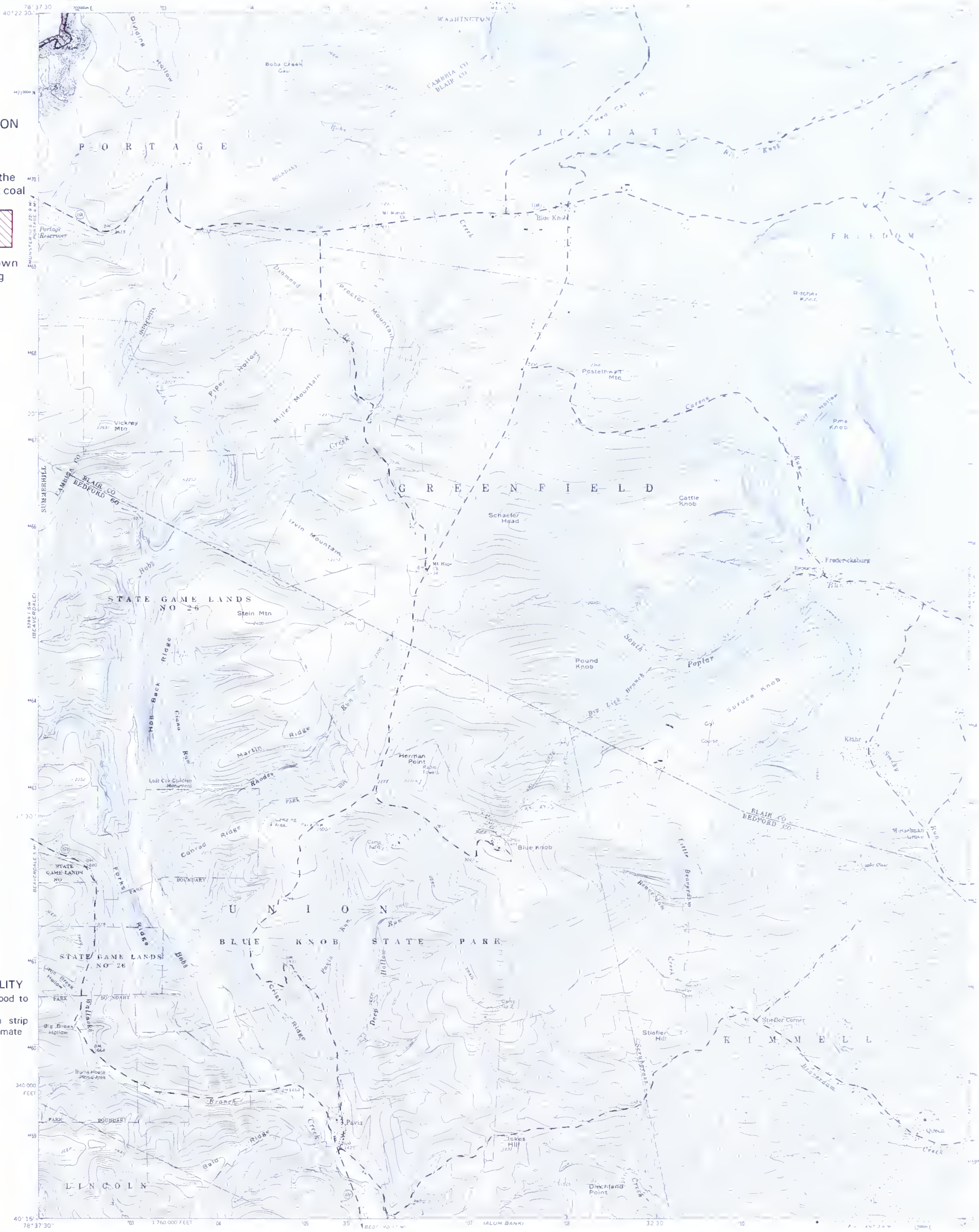
CROP LINE AND MINED-OUT AREA OF THE
UPPER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Freeport coal

▨ Extent of known strip mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and location of strip mine on topographic map.
Limits of strip mining based on interpretation of topographic map.

BLUE KNOB

CROP LINE AND MINED-OUT AREA OF THE
LOWER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

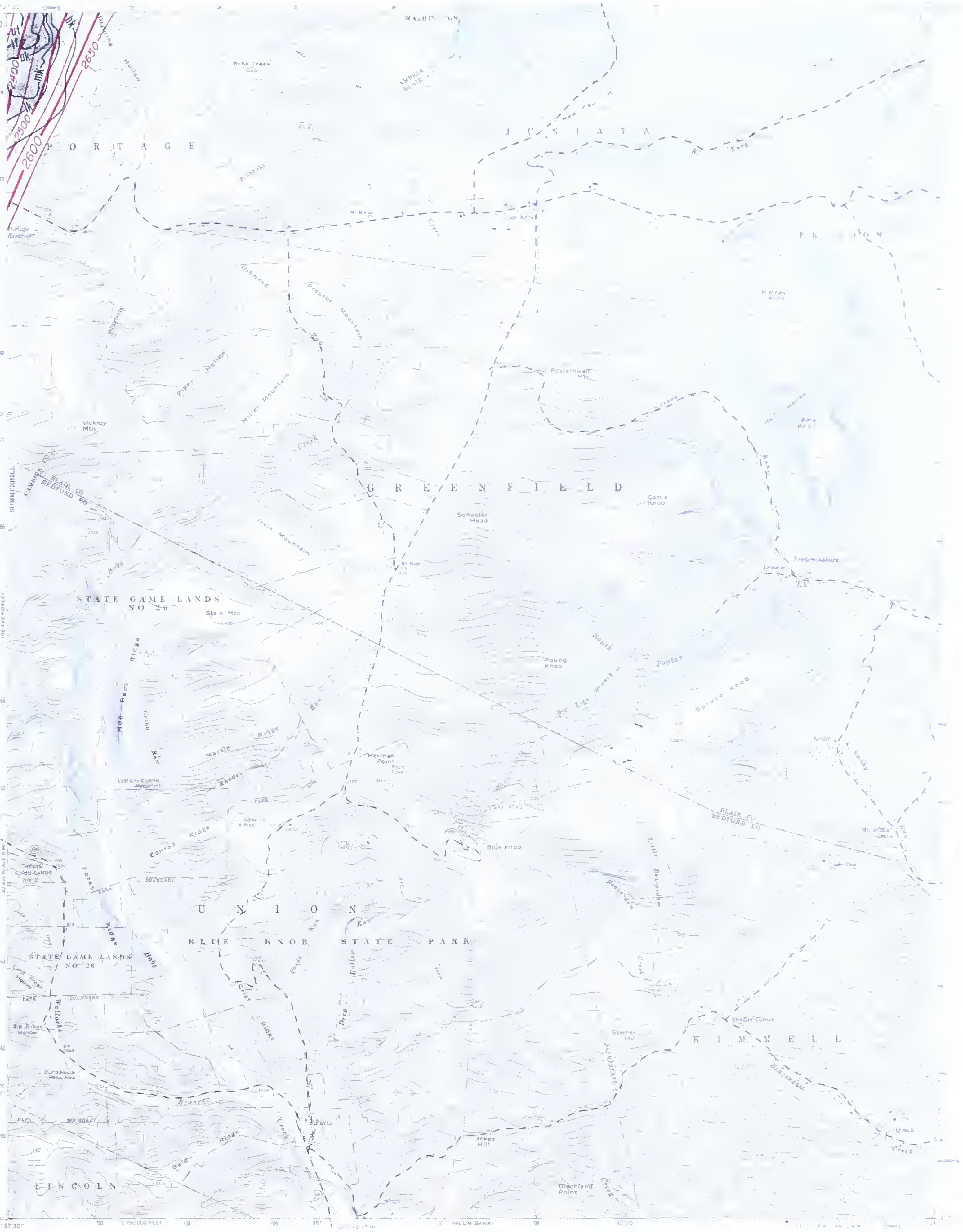
—lk— Lower Kittanning coal

—bk— Brookville coal

—2500— Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good



SOURCES

Crop lines of the Middle Kittanning and Lower Freeport coals by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map.

Other crop lines and structure contours modified by A. D. Glover from Butts (1905) using unpublished data and/or locations of strip mines on topographic map.

COAL CROP LINES AND STRUCTURE CONTOURS

BLUE KNOB

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

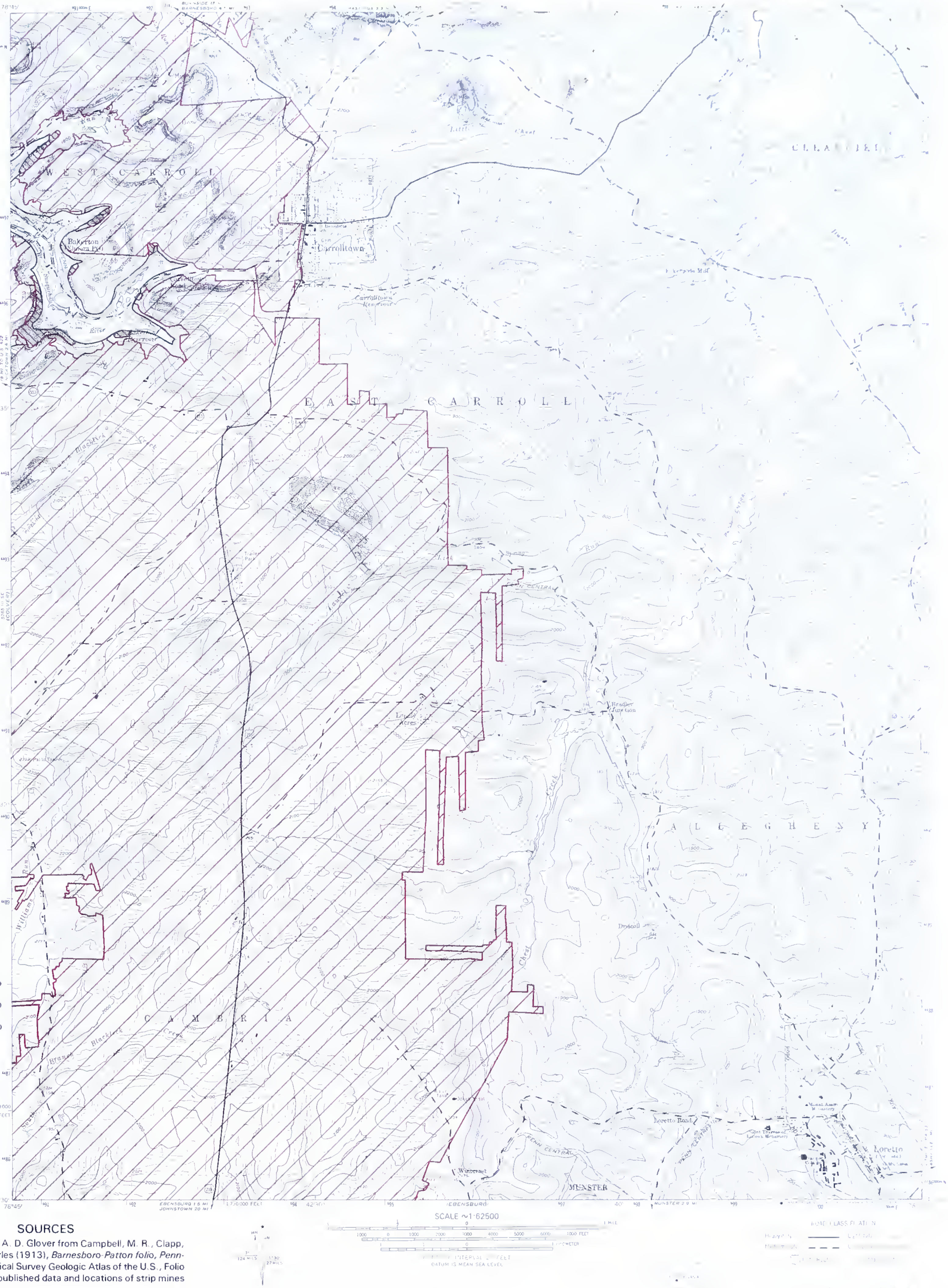
Crop line of the Lower Kittanning coal

▧ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate



SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.
Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CARROLLTOWN

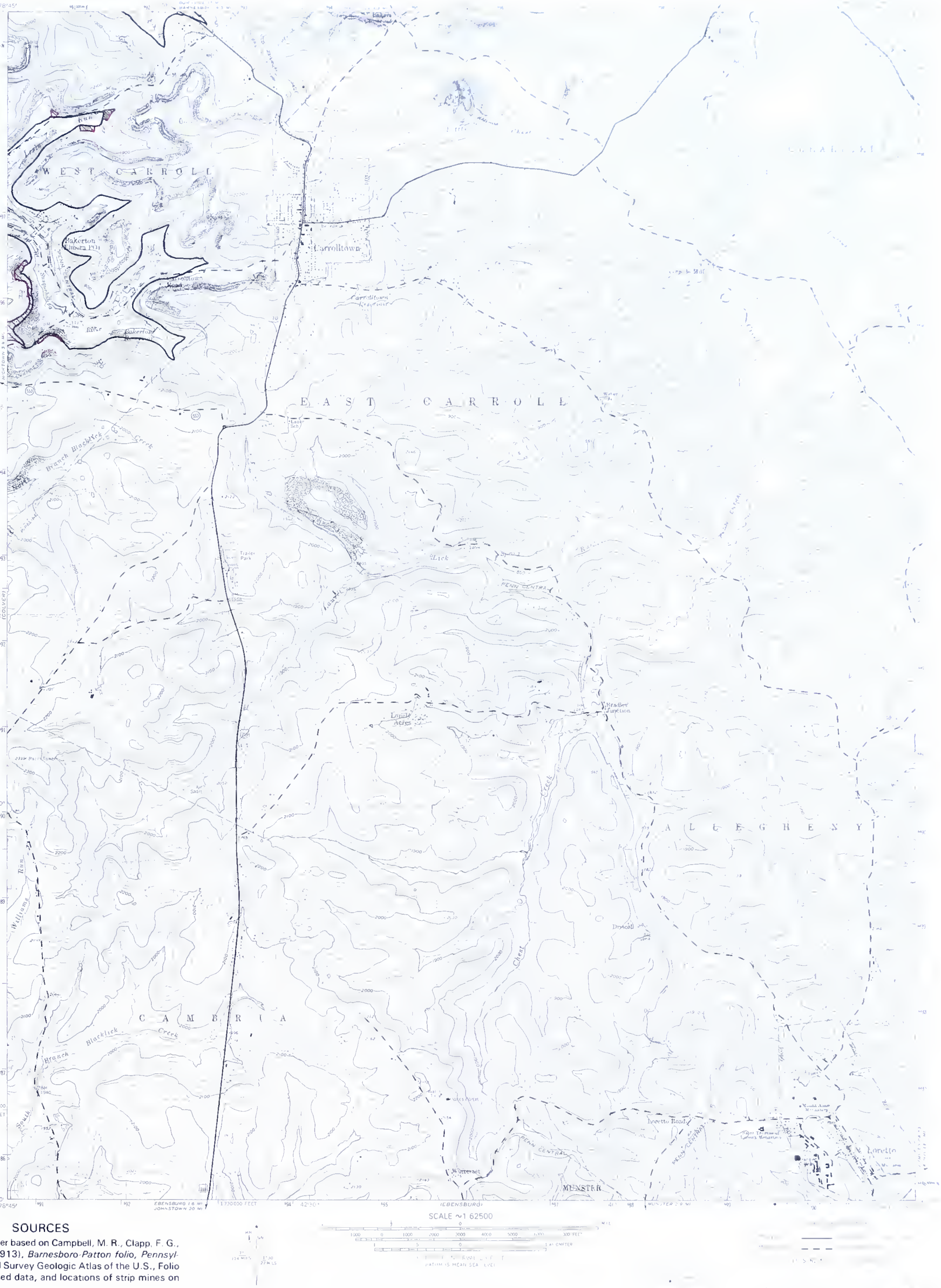
CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Middle Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

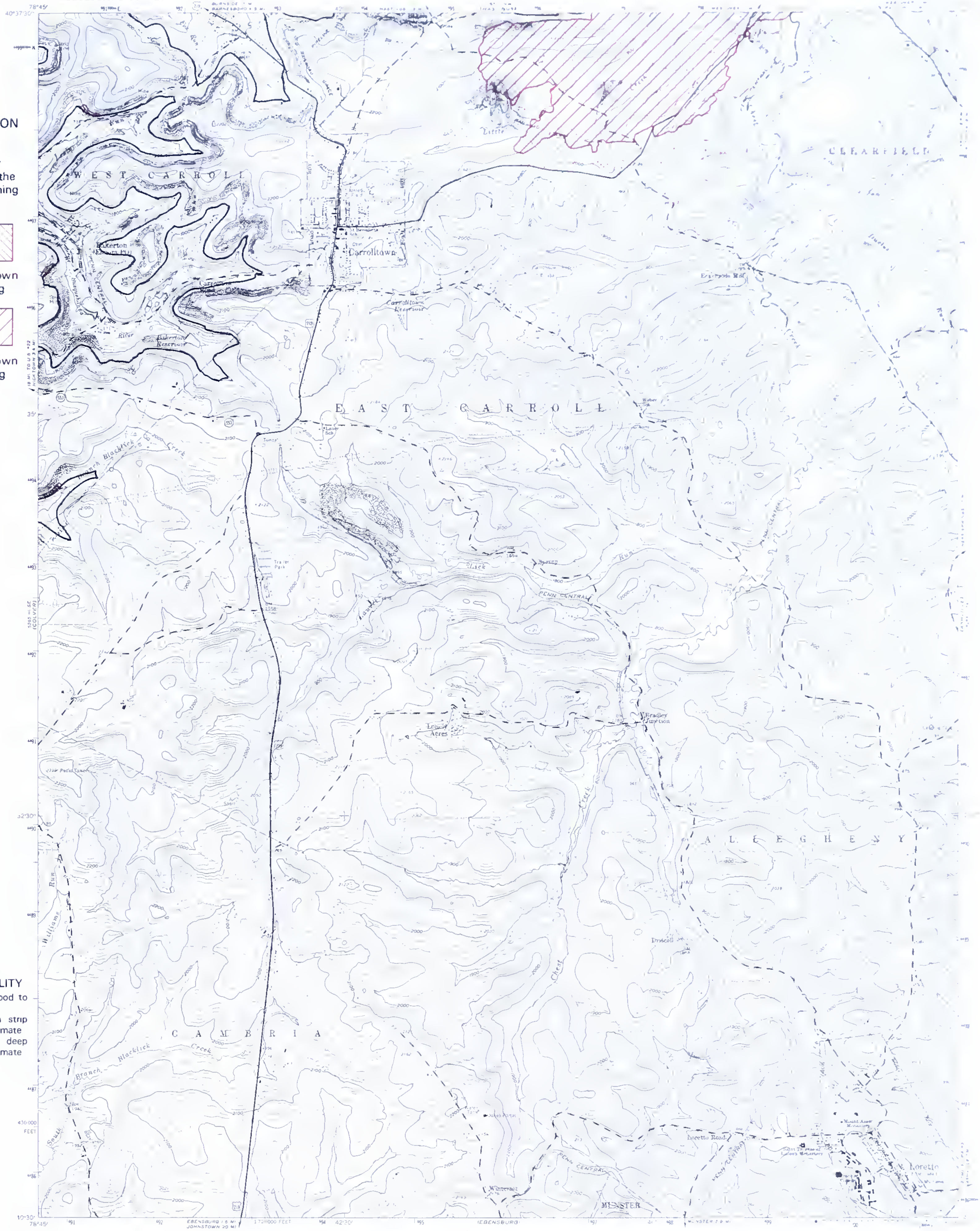
Crop line by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

CARROLLTOWN

CROP LINE AND MINED-OUT AREAS OF THE MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CARROLLTOWN

CROP LINE AND MINED-OUT AREAS OF THE UPPER KITTANNING COAL

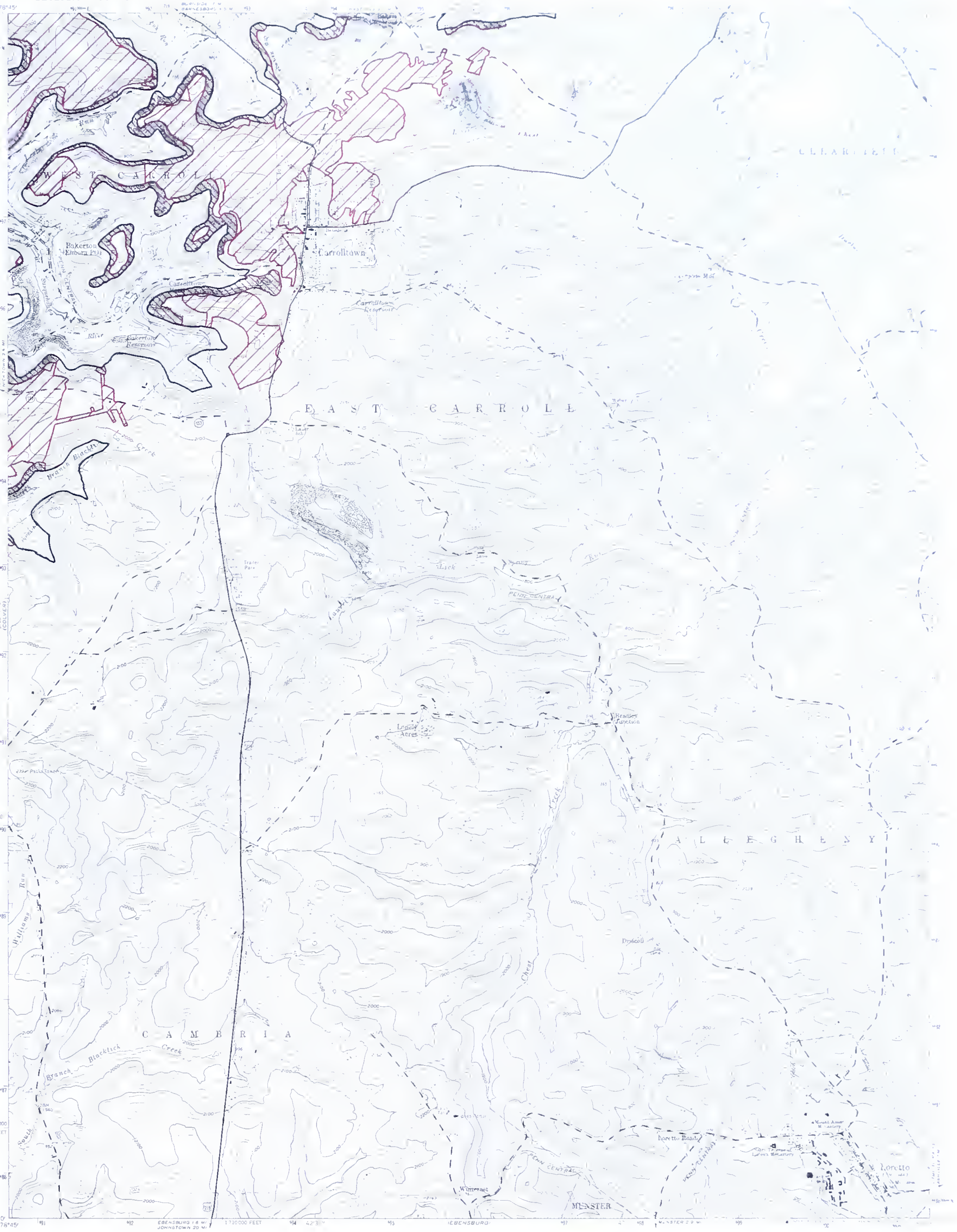
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Lower Freeport coal

▧ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CARROLLTOWN

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

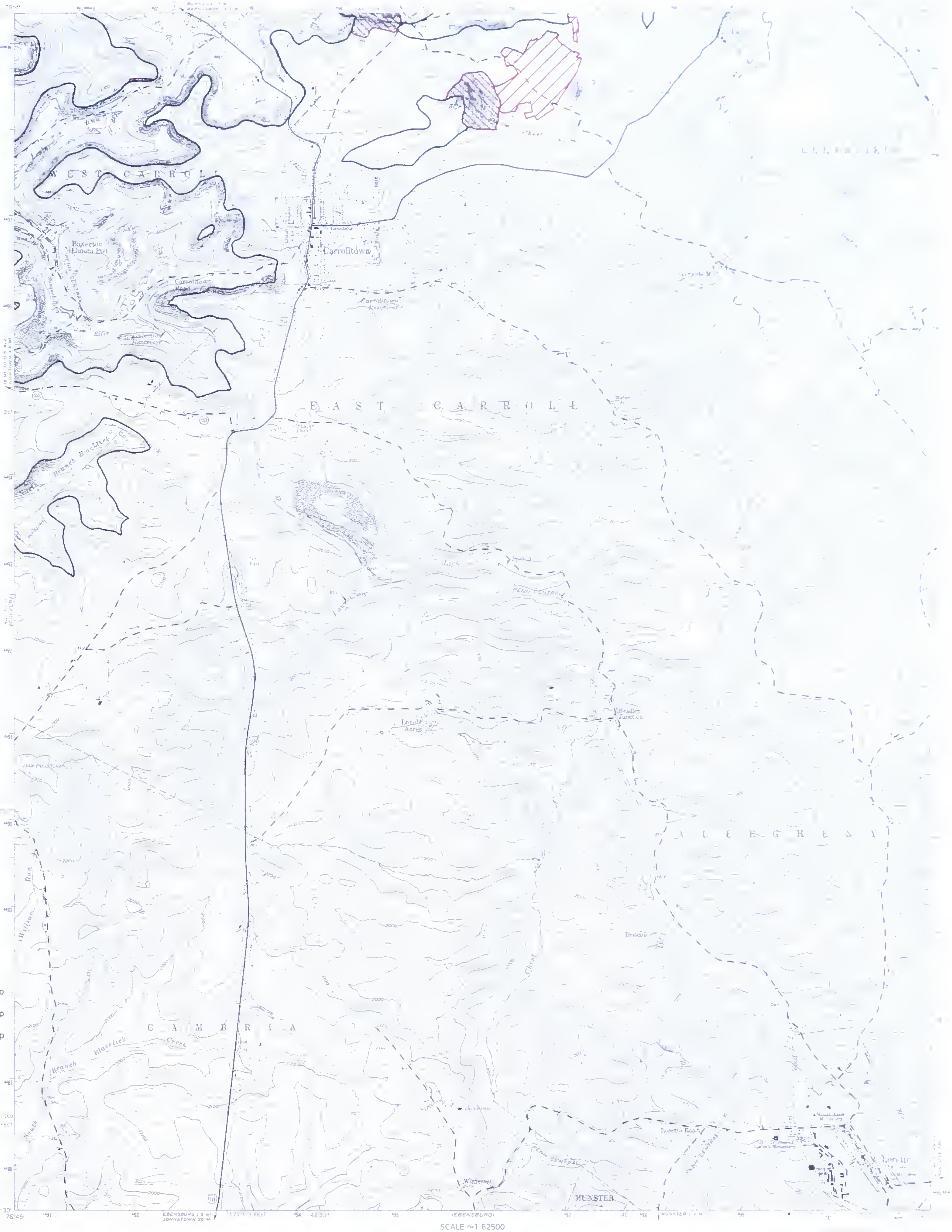
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line—good to very good

Limits of known strip mining—approximate

Limits of known deep mining—approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CARROLLTOWN

CROP LINE AND MINED-OUT AREAS OF THE

UPPER FREEPORT COAL

EXPLANATION

CROP LINES

uf
Upper Freeport coal

lf
Lower Freeport coal

uk
Upper Kittanning coal

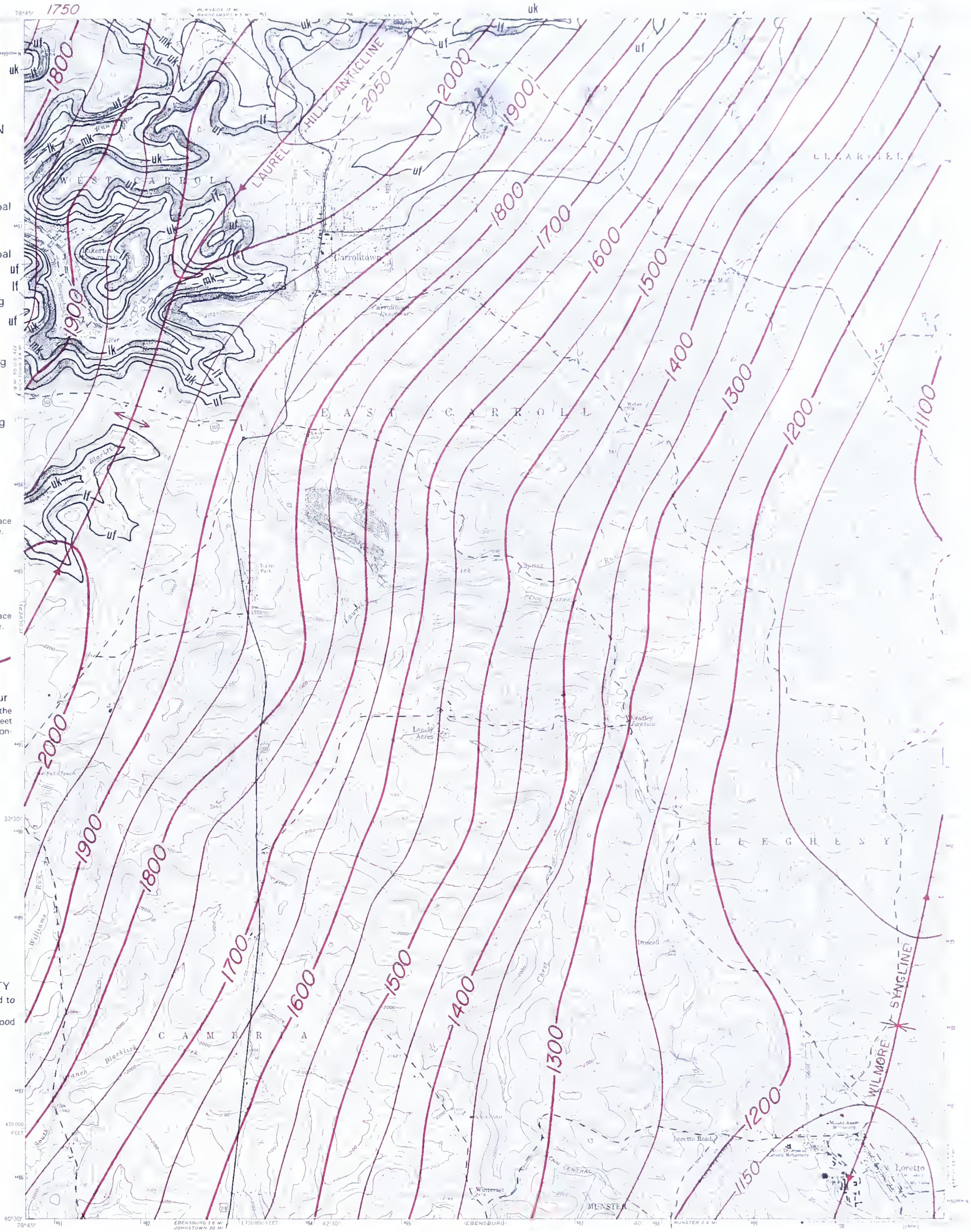
mk
Middle Kittanning coal

lk
Lower Kittanning coal

Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

1500
Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.



MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good

SOURCES

Crop line of the Middle Kittanning coal by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Other crop lines and structure contours modified by A. D. Glover from Campbell and others (1913) using unpublished data and locations of strip mines on topographic map.

SCALE 1:62500

UTM GRID AND 1972 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

CARROLLTOWN

COAL CROP LINES AND STRUCTURE CONTOURS

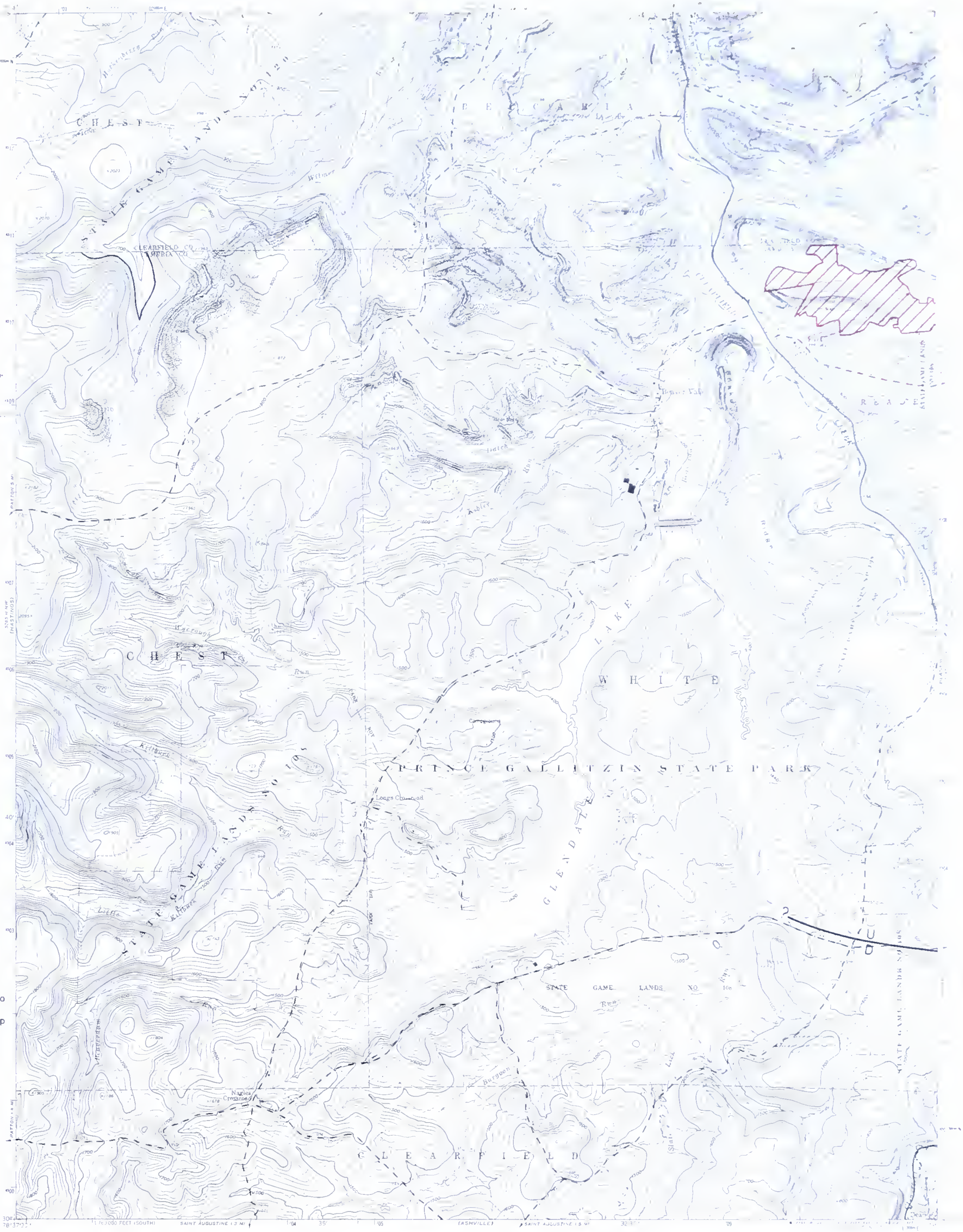
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Kittanning coal

▨ Extent of known deep mining

U/D Wrench fault
U, upthrown side; D, downthrown side.



SCALE ~1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MAP RELIABILITY

Coal crop line--good to very good
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data.
Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.
Position of wrench fault by A. D. Glover based on unpublished data.

COALPORT

CROP LINE AND MINED-OUT AREA OF THE
LOWER KITTANNING COAL

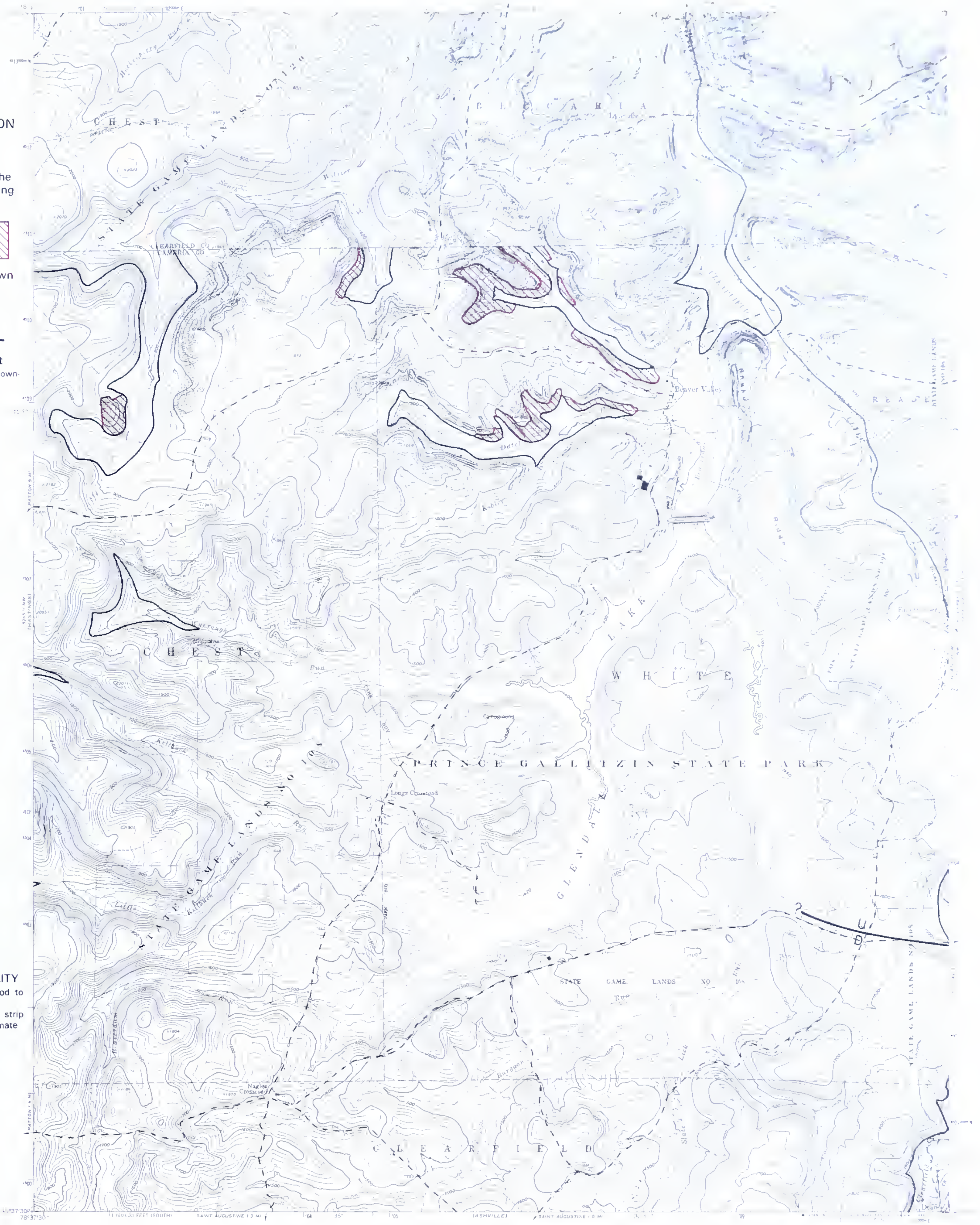
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Position of wrench fault by A. D. Glover based on unpublished data.

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

COALPORT

CROP LINE AND MINED-OUT AREAS OF THE

UPPER KITTANNING COAL

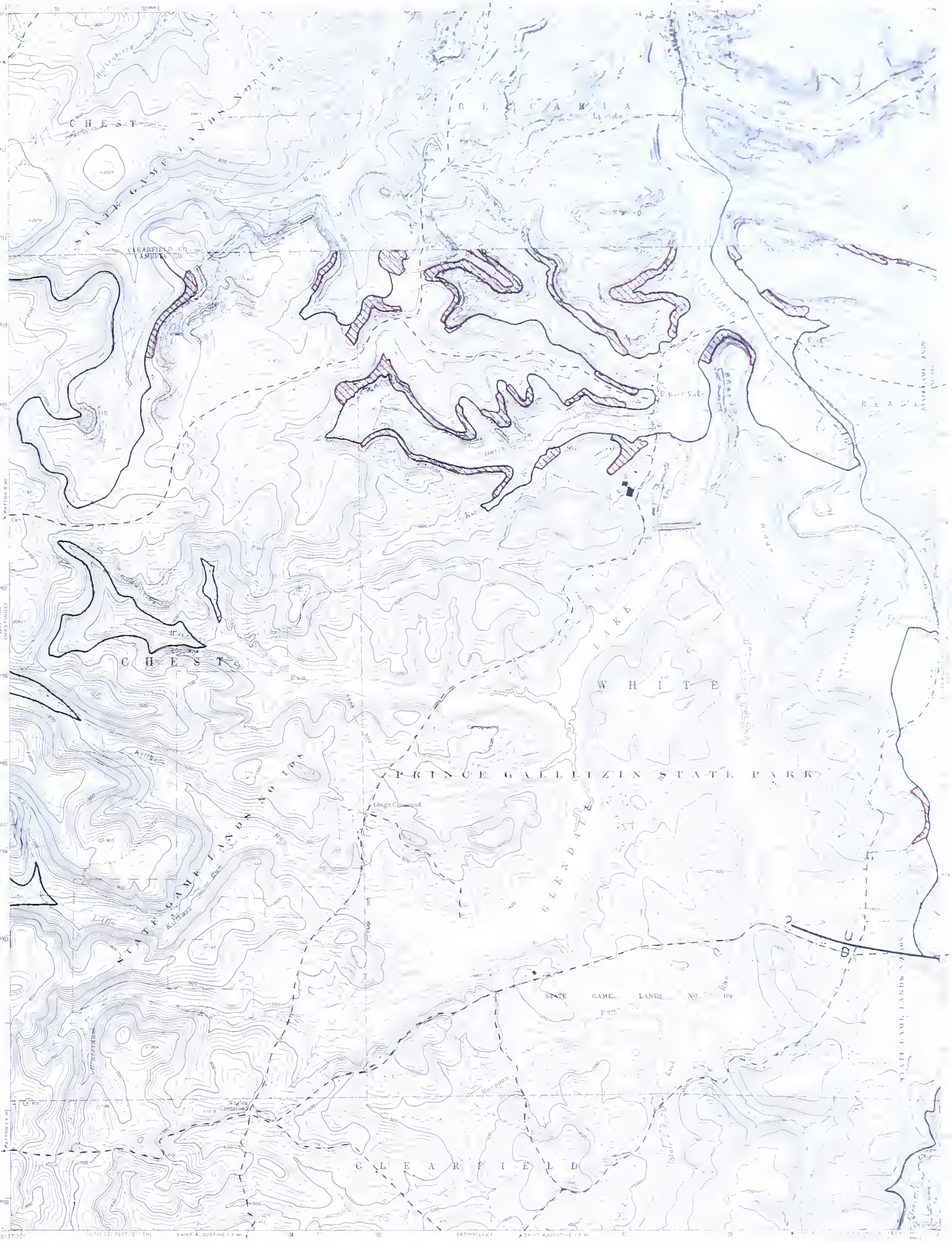
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Freeport coal

▨ Extent of known strip mining

Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Position of wrench fault by A. D. Glover based on unpublished data.

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

COALPORT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

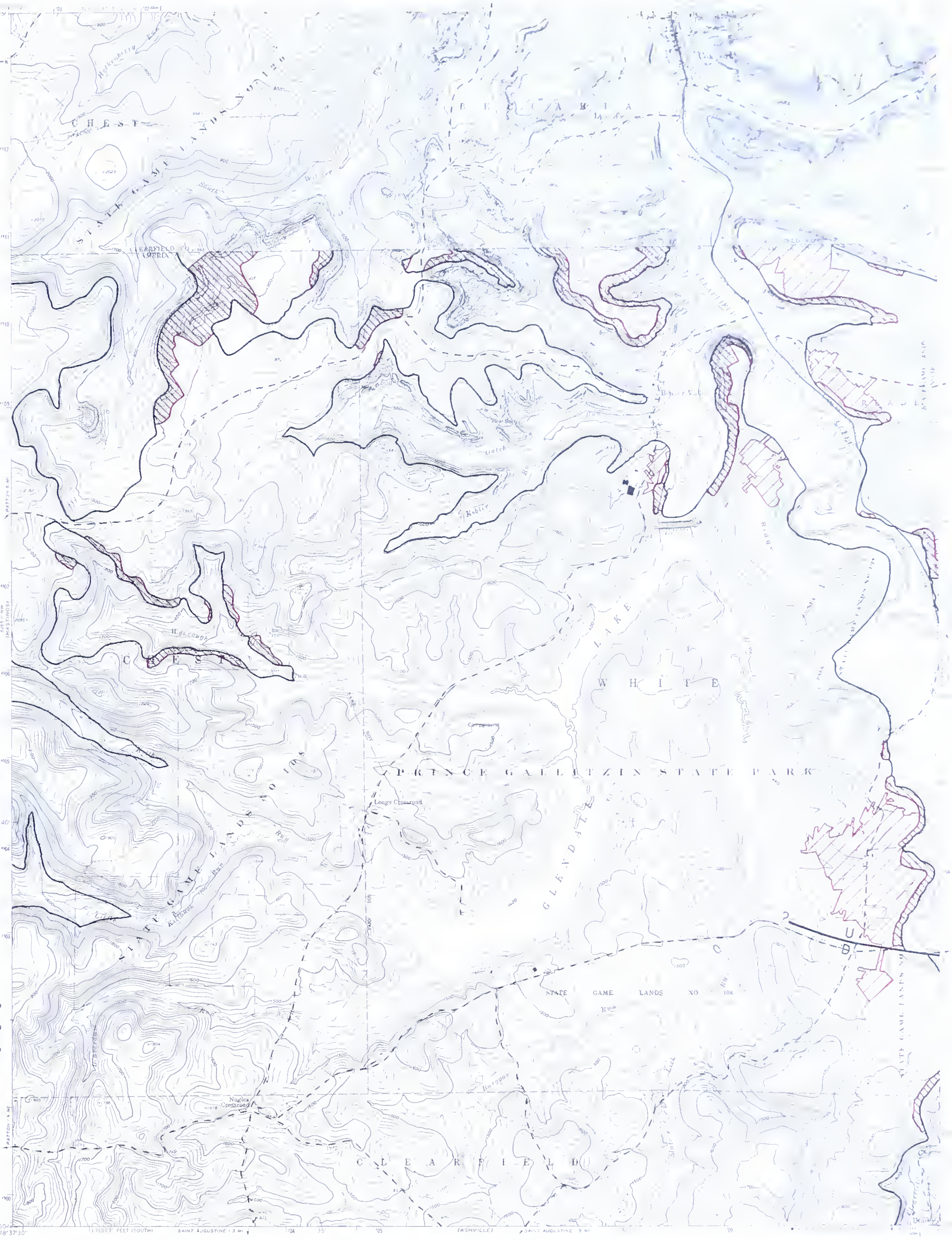
EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining

Wrench fault
U, upthrown side; D, downthrown side.



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

Position of wrench fault by A. D. Glover based on unpublished data.

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

COALPORT

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

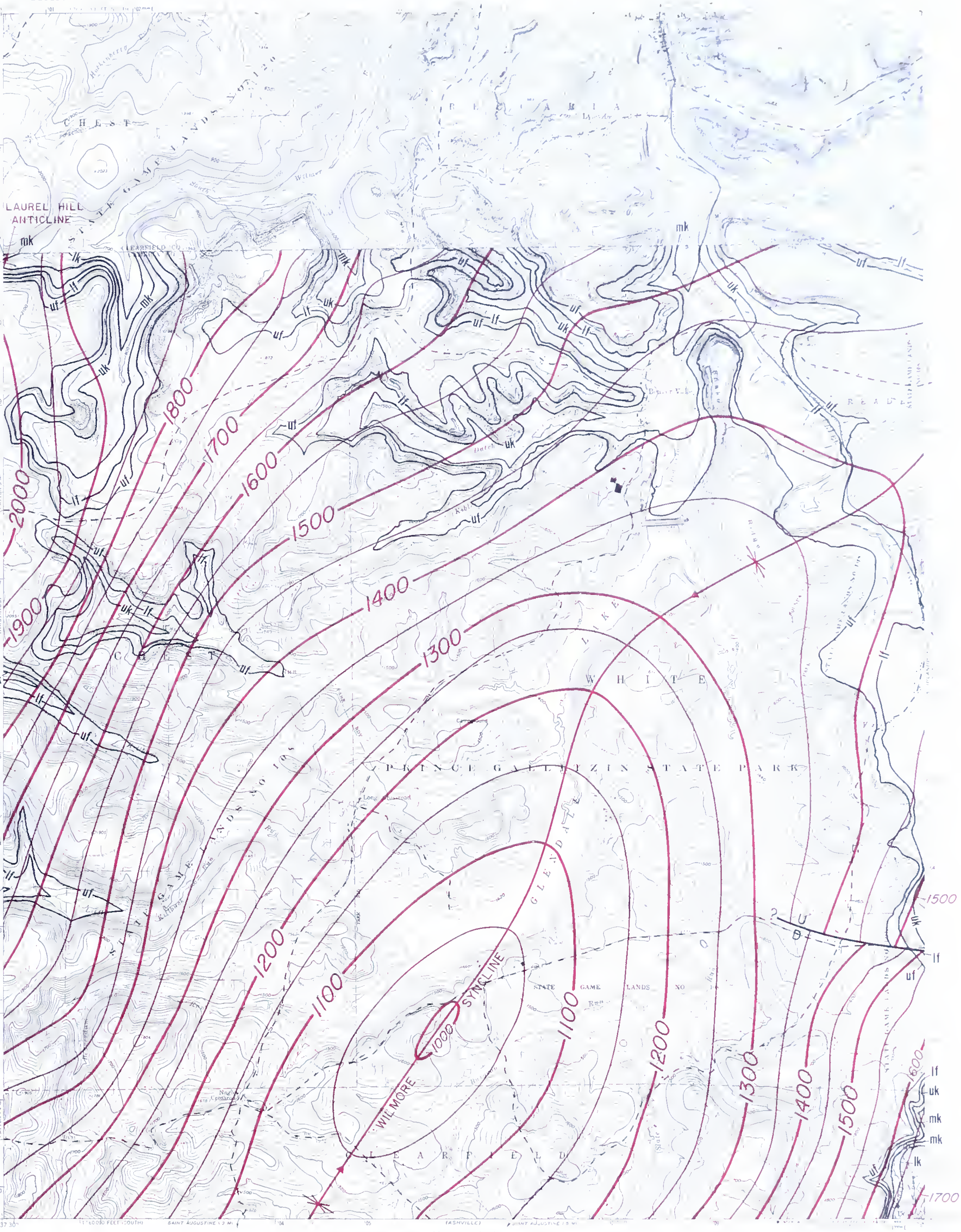
—1500— **Structure contour**
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.

U/D **Wrench fault**
U, upthrown side; D, downthrown side.

MAP RELIABILITY

Coal crop lines--good to very good

Structure contours--good to very good



SOURCES

Crop line of the Middle Kittanning coal by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., and unpublished data.

Other crop lines modified by A. D. Glover from Campbell and others (1913) using unpublished data and/or locations of strip mines on topographic map.

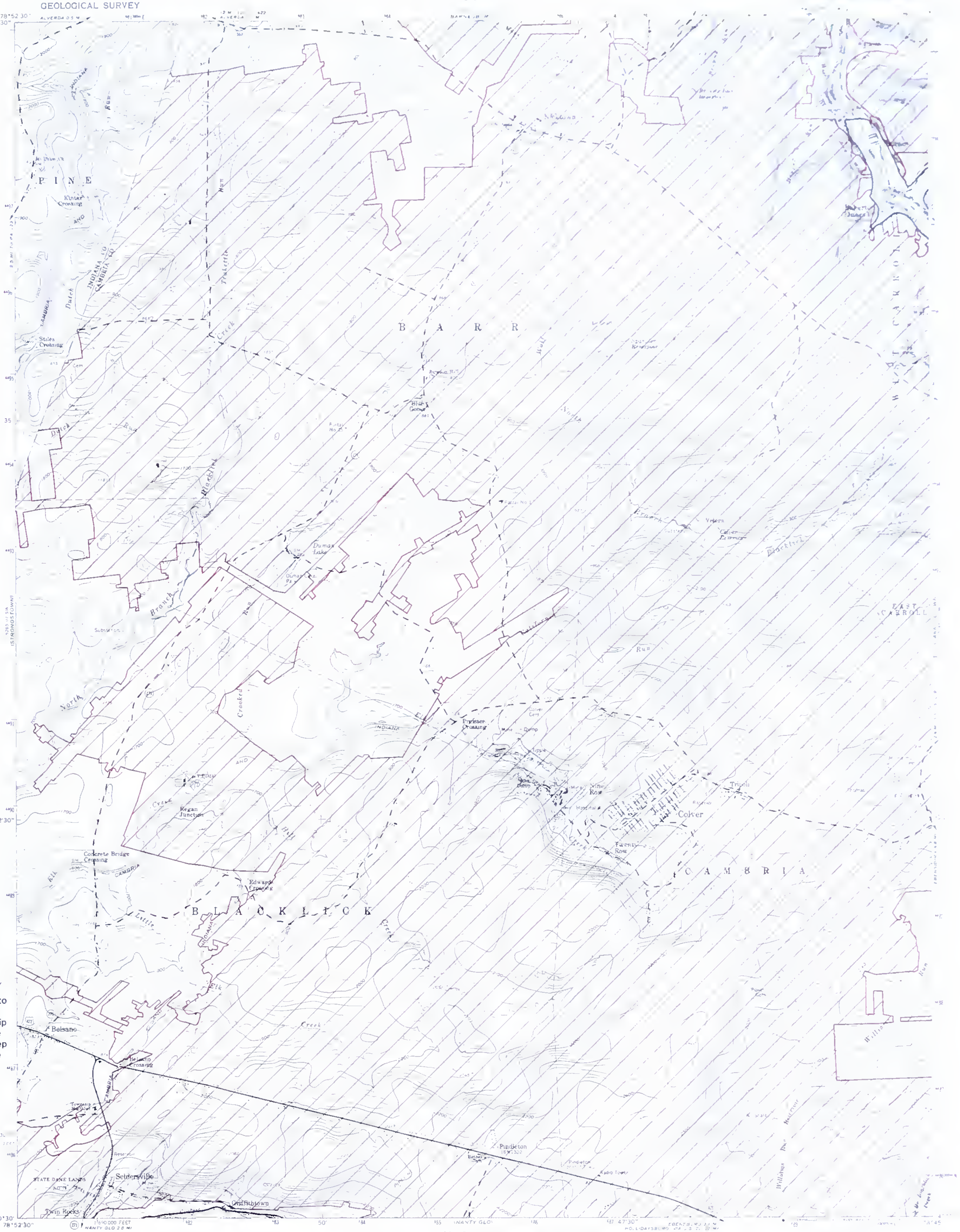
Structure contours modified by A. D. Glover and W. E. Edmunds, Consulting Geologist, from Campbell and others (1913) using unpublished data and locations of strip mines on topographic map.

Position of wrench fault by A. D. Glover based on unpublished data.

COALPORT

COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

～ Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and location of strip mine on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

COLVER

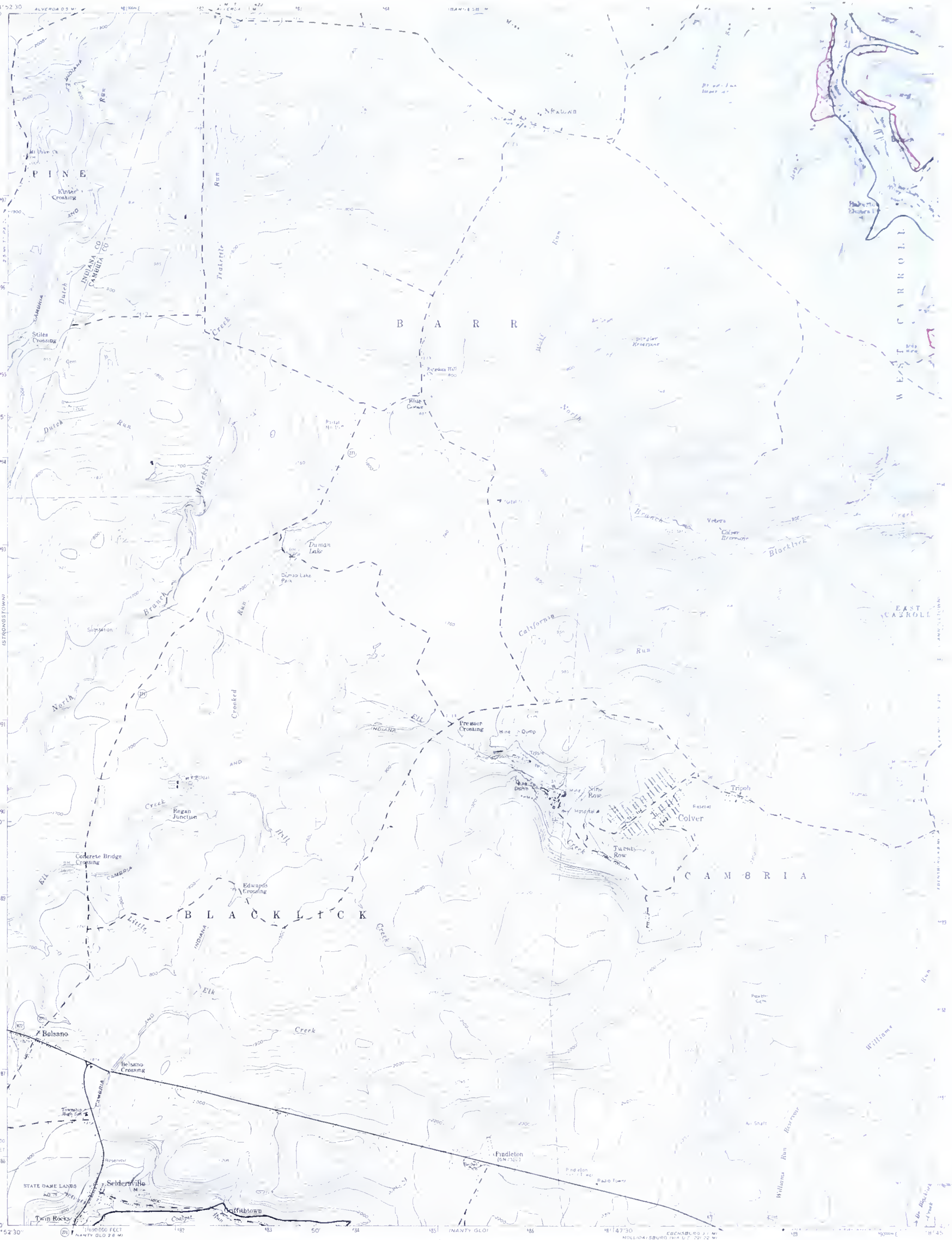
CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

COLVER

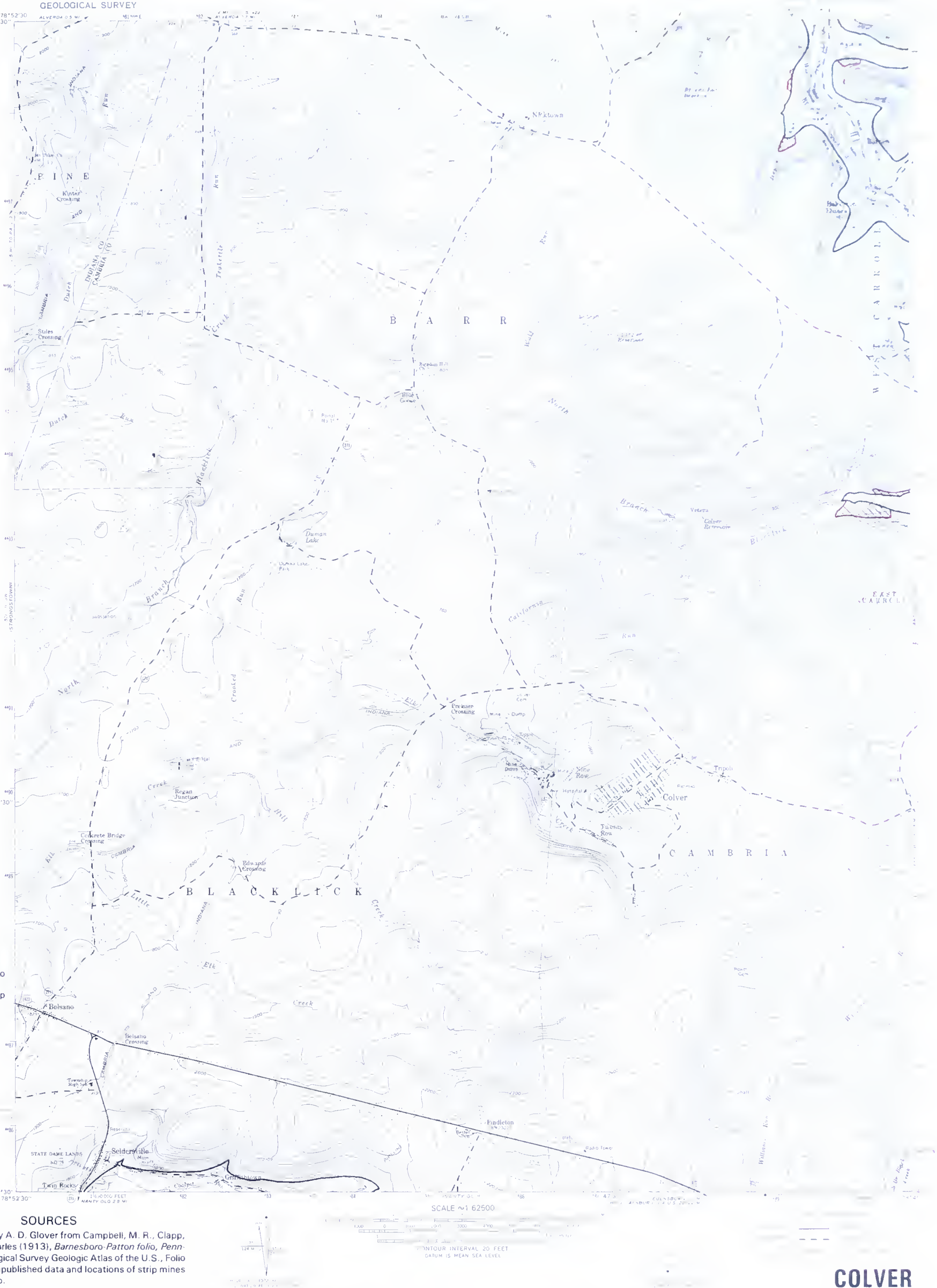
CROP LINE AND MINED-OUT AREAS OF THE MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

～ Crop line of the Upper Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

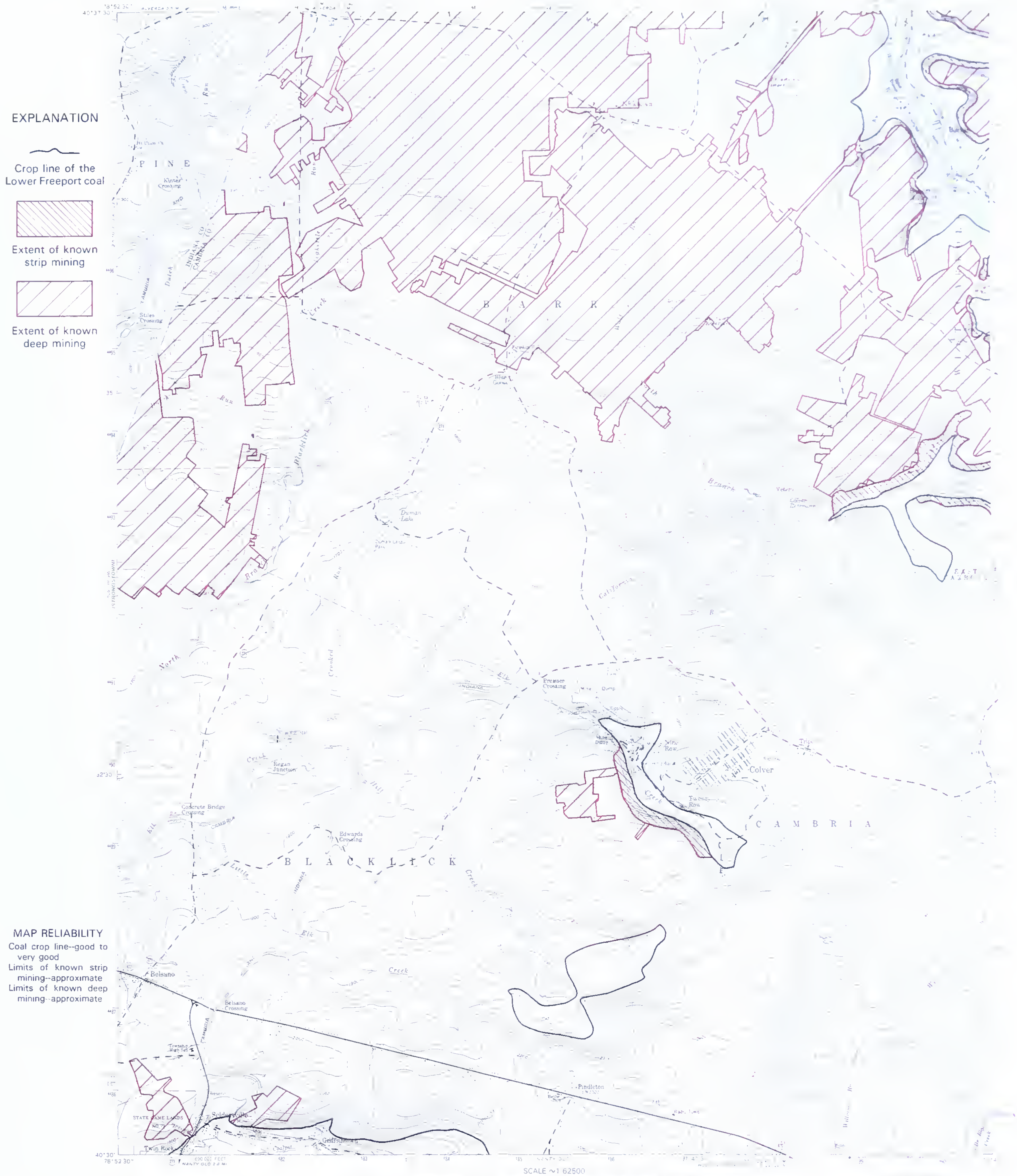
Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

COLVER

CROP LINE AND MINED-OUT AREAS OF THE
UPPER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

〰 Crop line of the Lower Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CROP LINE AND MINED-OUT AREAS OF THE

LOWER FREEPORT COAL

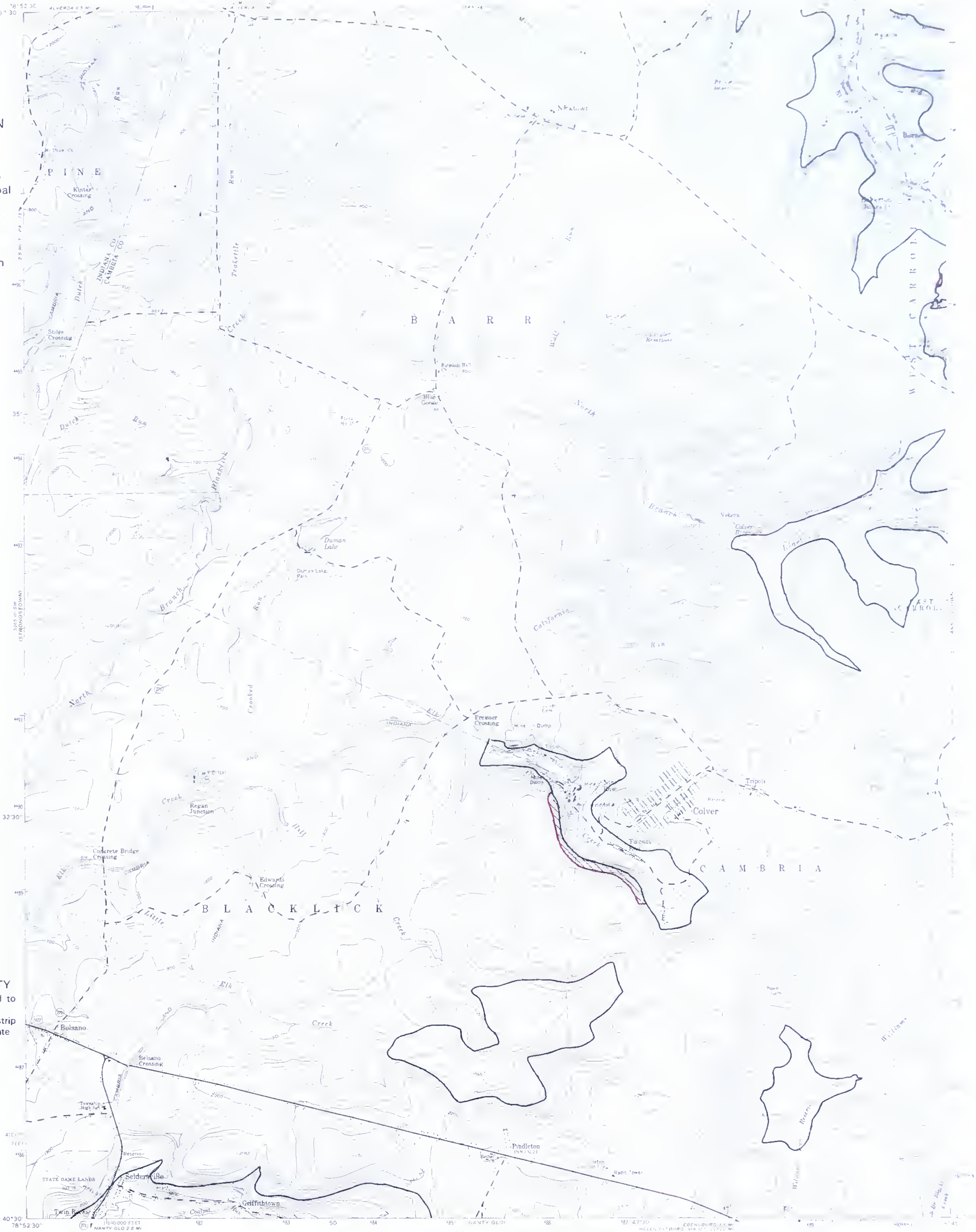
COLVER

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Upper Freeport coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

COLVER

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

—bc— Brush Creek coal

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

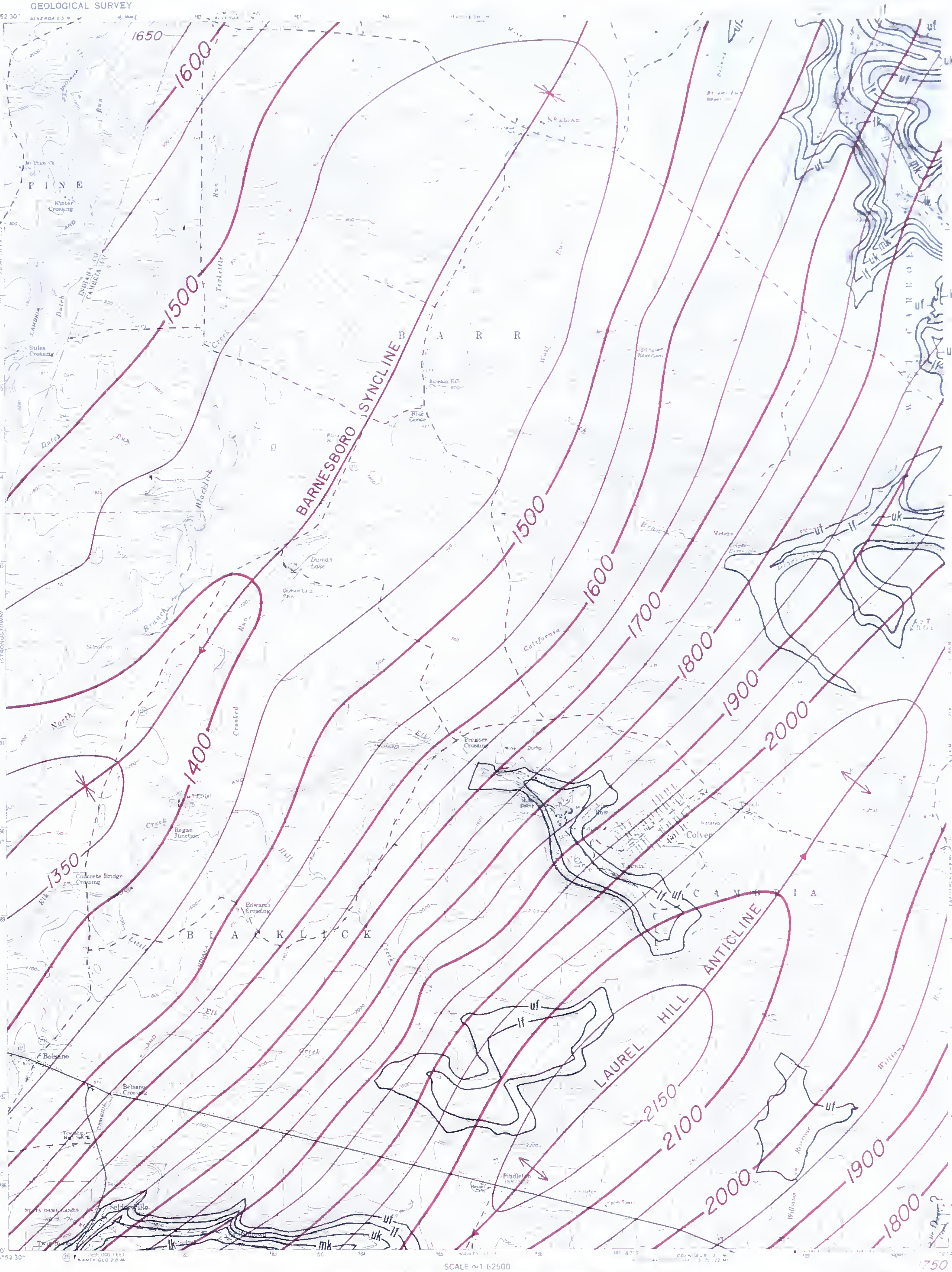
Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

—2000—
Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good



SOURCES

Crop lines of the Middle Kittanning and Brush Creek coals by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Other crop lines and structure contours modified by A. D. Glover from Campbell and others (1913) using unpublished data and/or locations of strip mines on topographic map.

COLVER

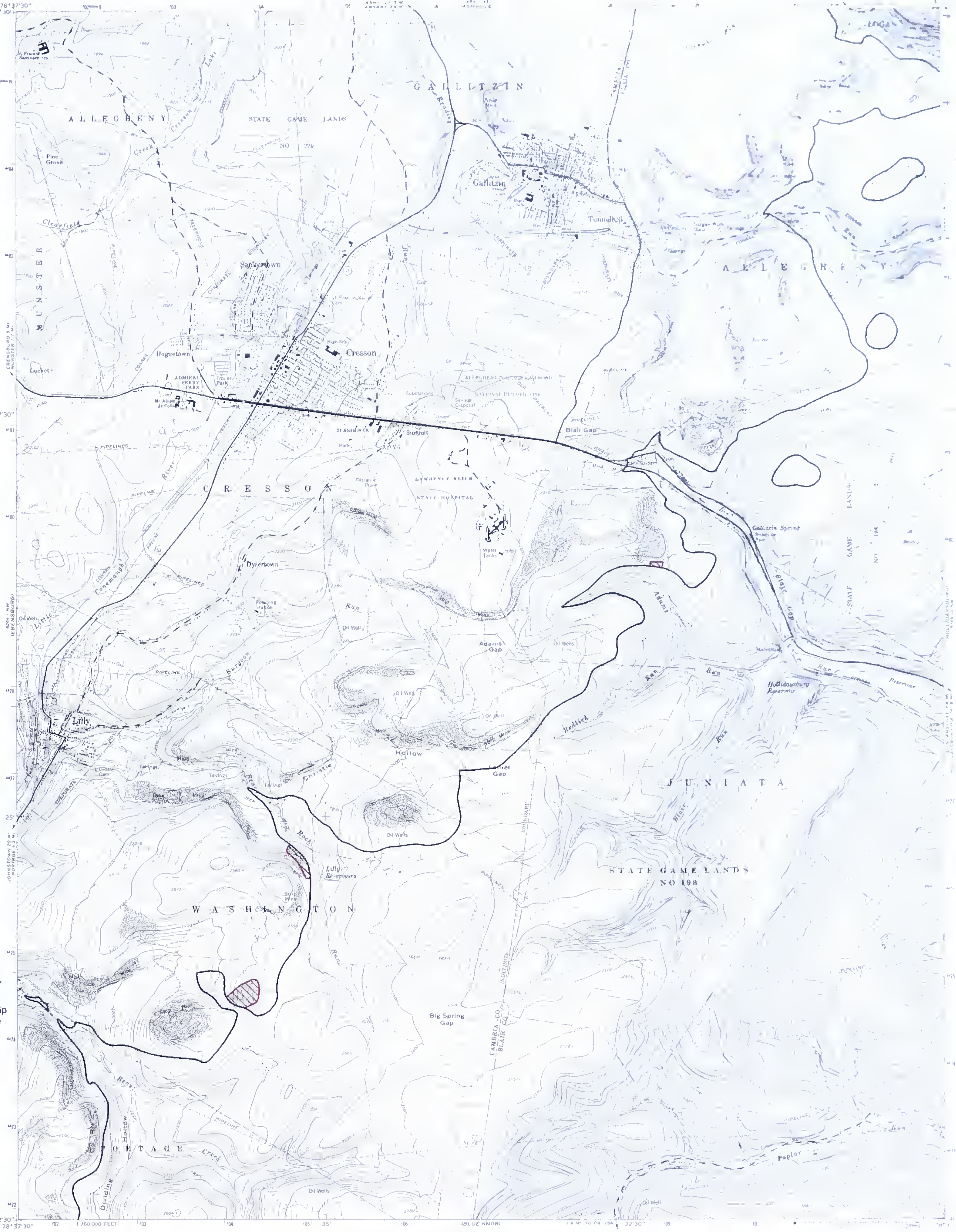
COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Brookville coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

CRESSON

CROP LINE AND MINED-OUT AREAS OF THE
BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

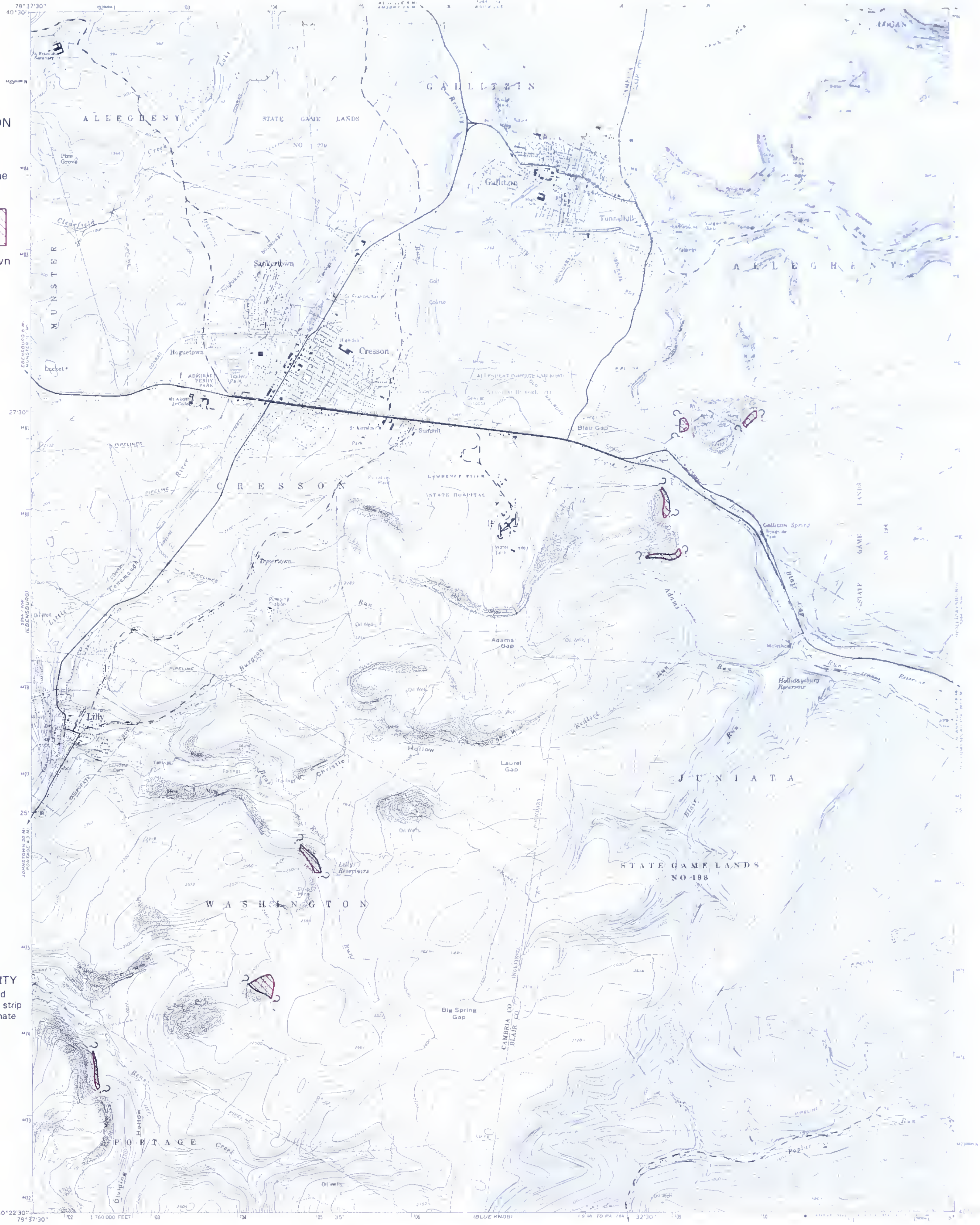
EXPLANATION

Crop line of the Clarion coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good
Limits of known strip mining--approximate



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SOURCES

Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

CRESSON

CROP LINE AND MINED-OUT AREAS OF THE
CLARION COAL

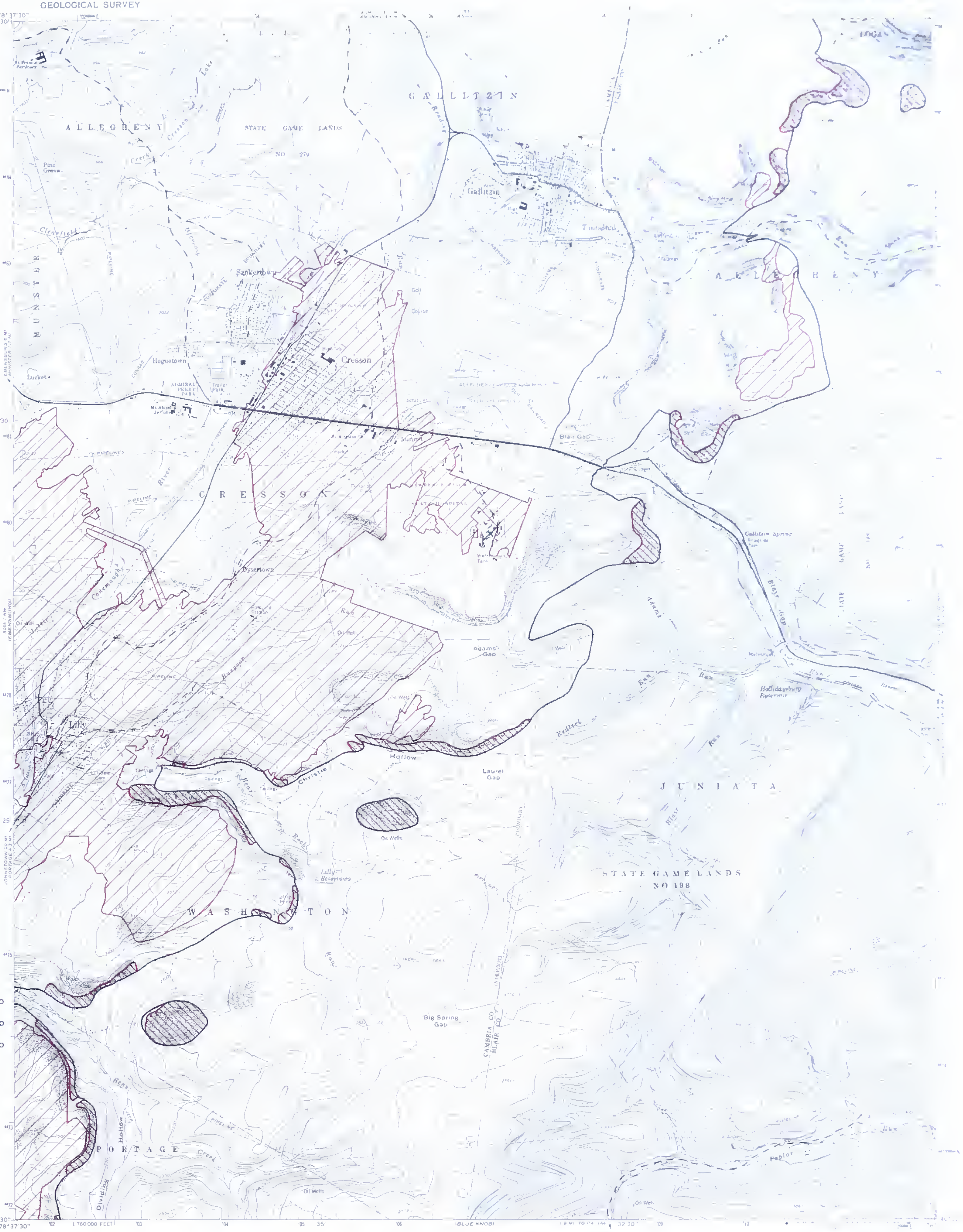
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CRESSON

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

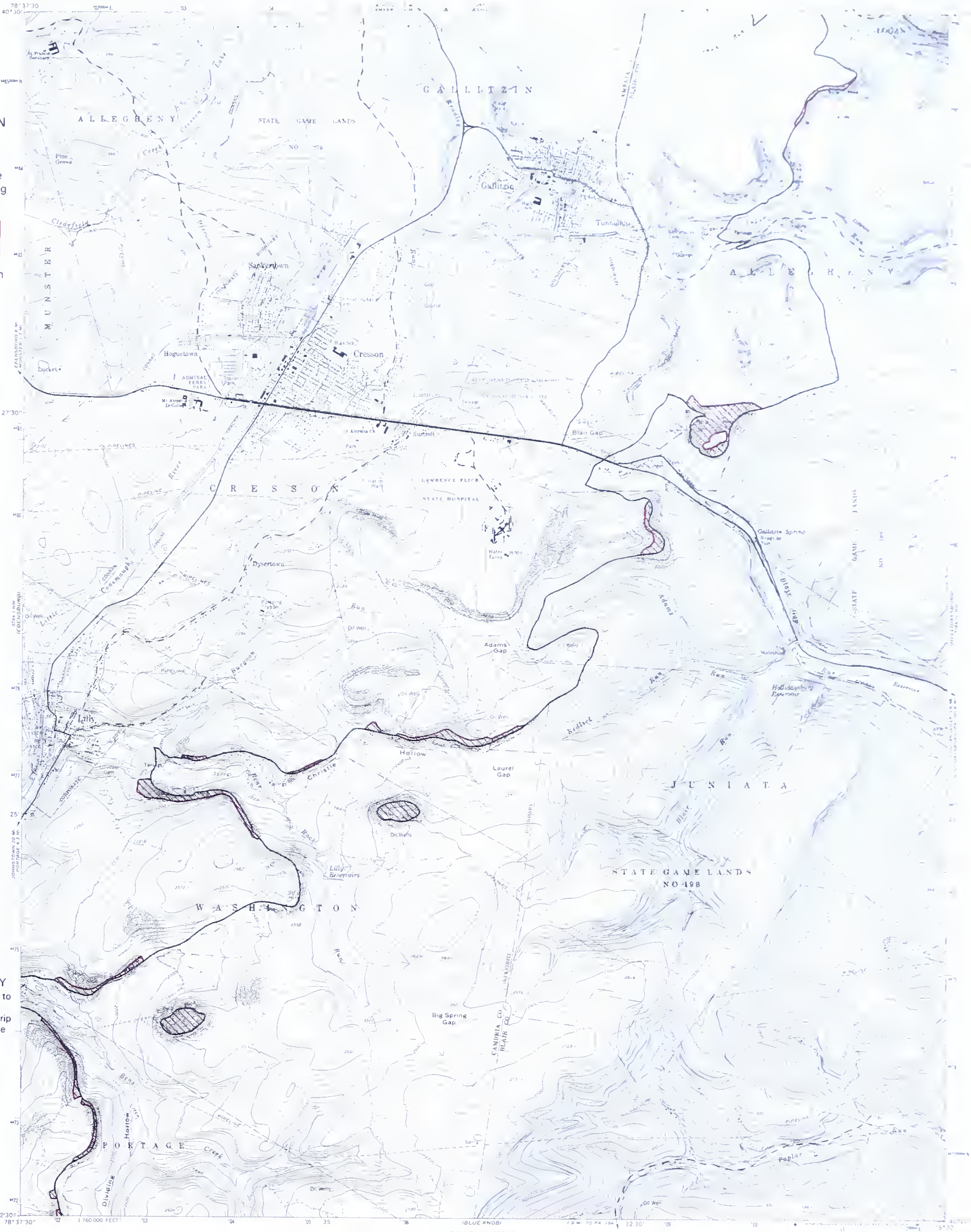
〰 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line—good to very good

Limits of known strip mining—approximate



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SOURCES

Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

CRESSON

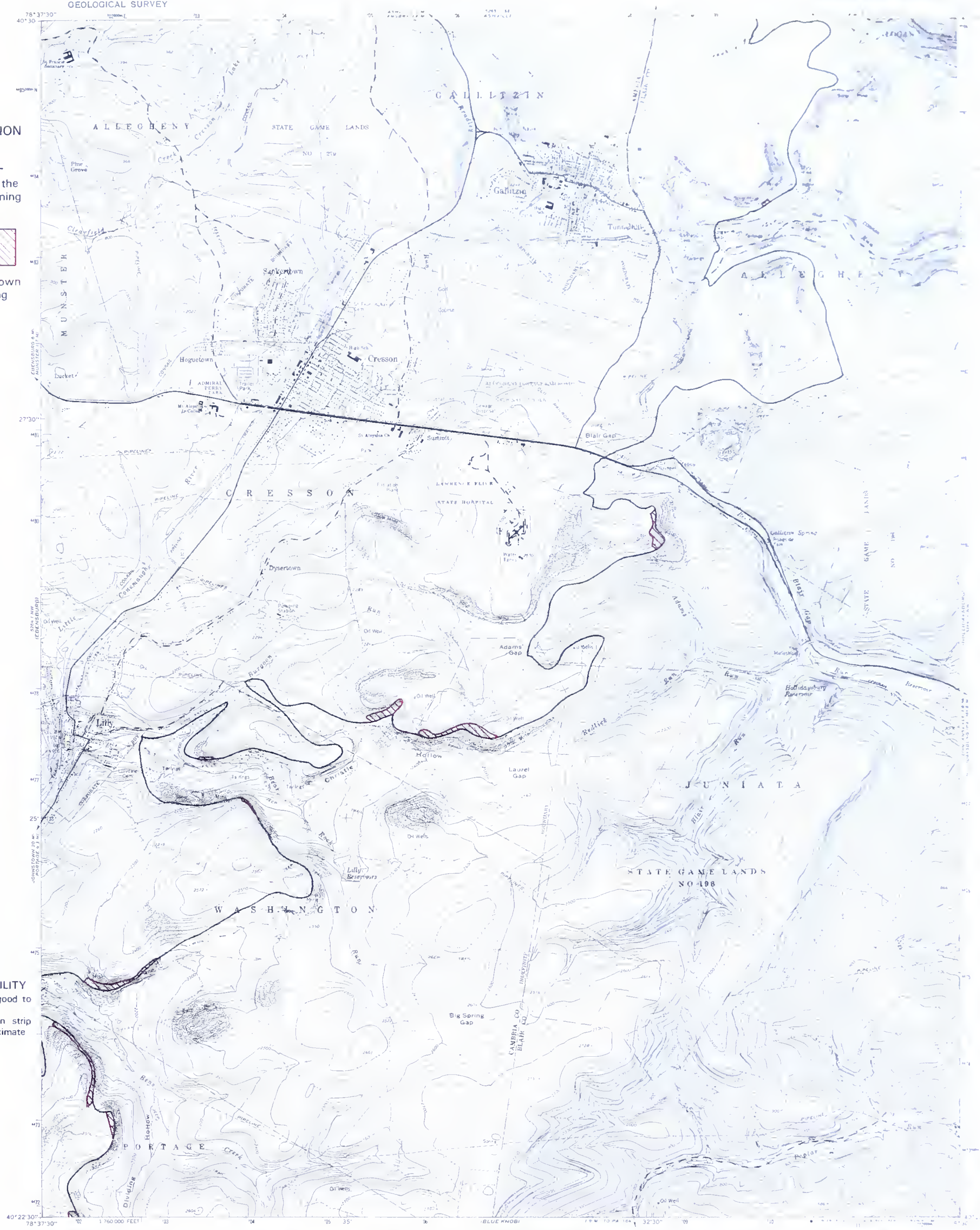
CROP LINE AND MINED-OUT AREAS OF THE
MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

∼ Crop line of the Upper Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

CRESSON

CROP LINE AND MINED-OUT AREAS OF THE UPPER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

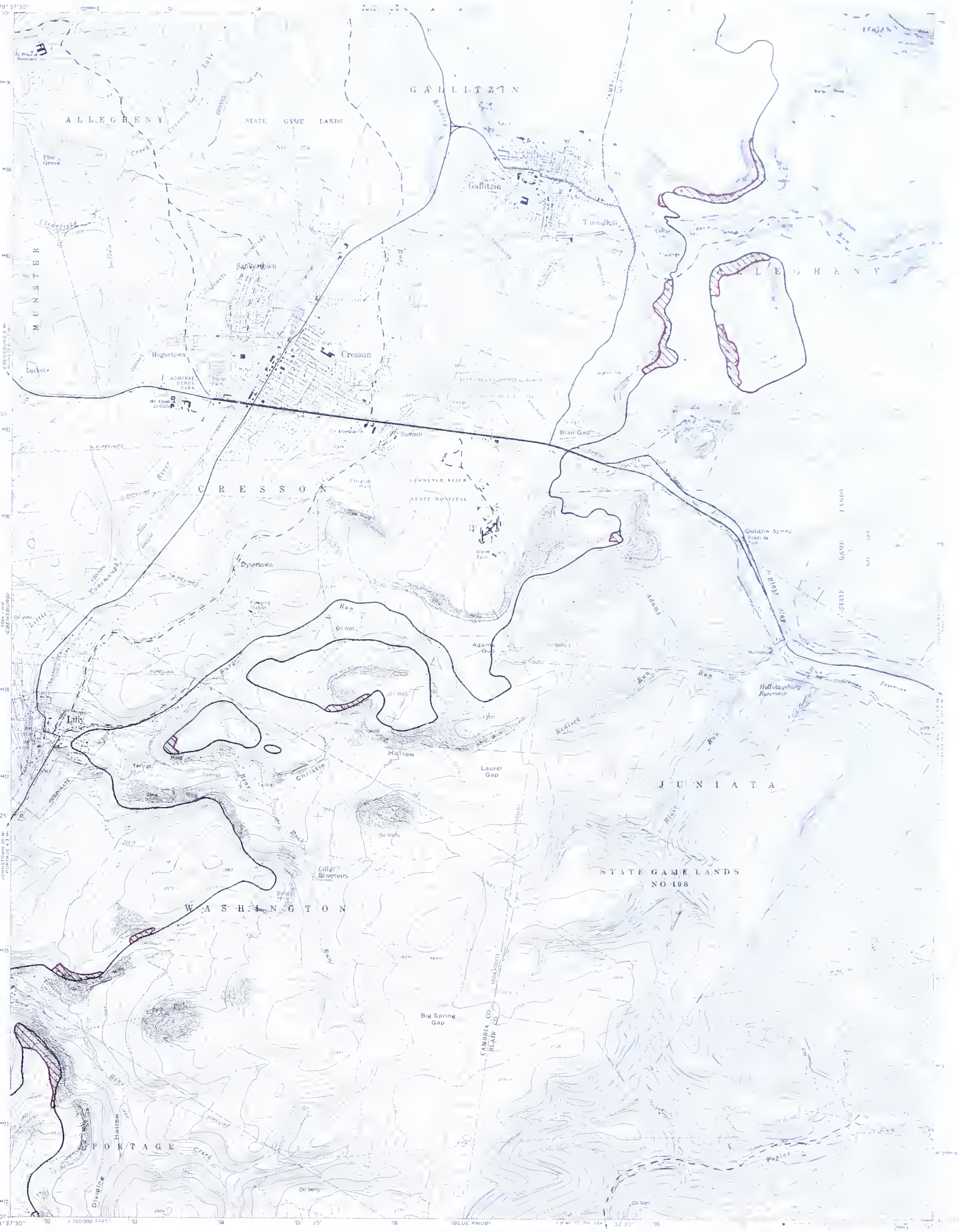
~ Crop line of the Lower Freeport coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SOURCES

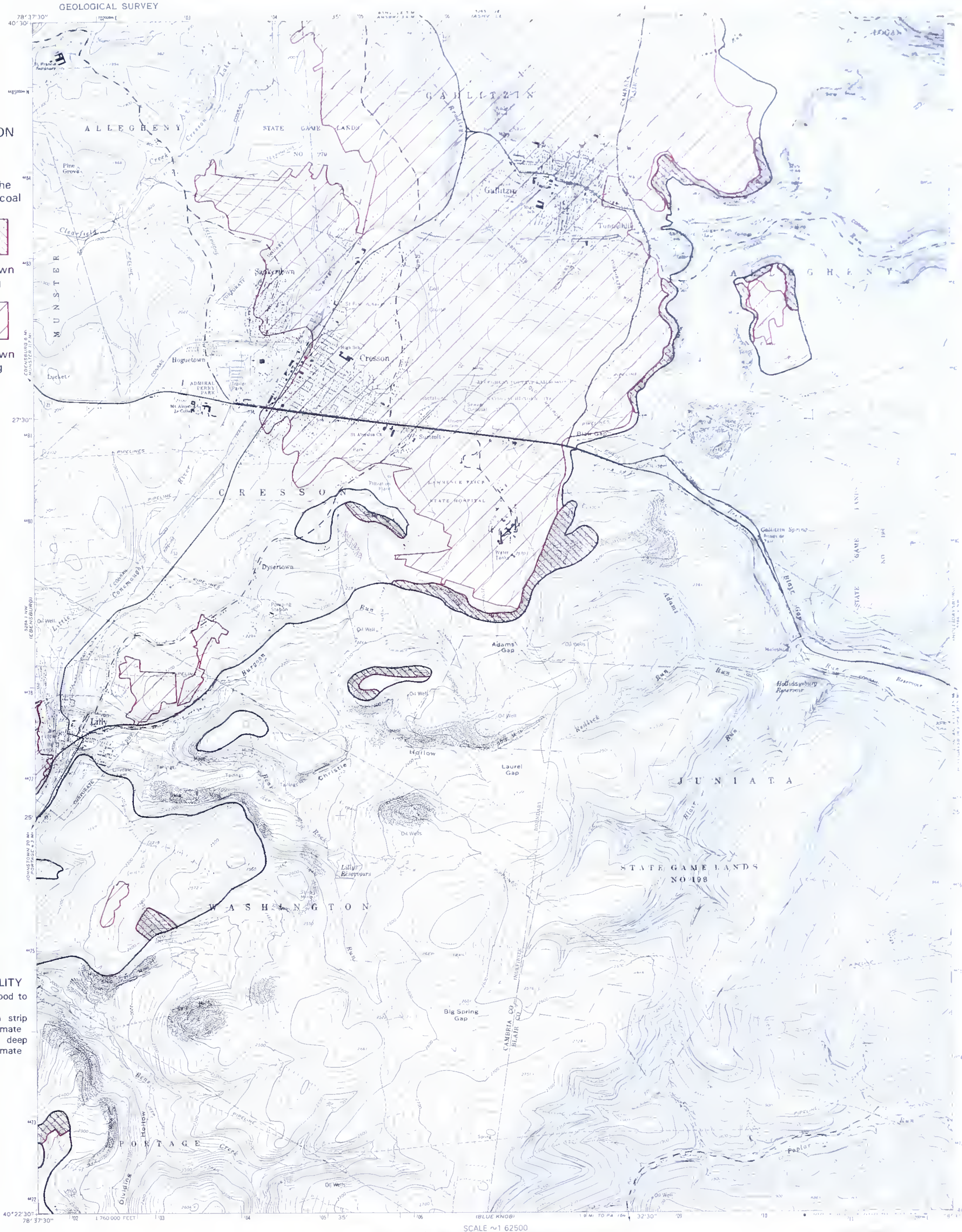
Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

CRESSON

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



SCALE 1:62 500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CRESSON

CROP LINE AND MINED-OUT AREAS OF THE

UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

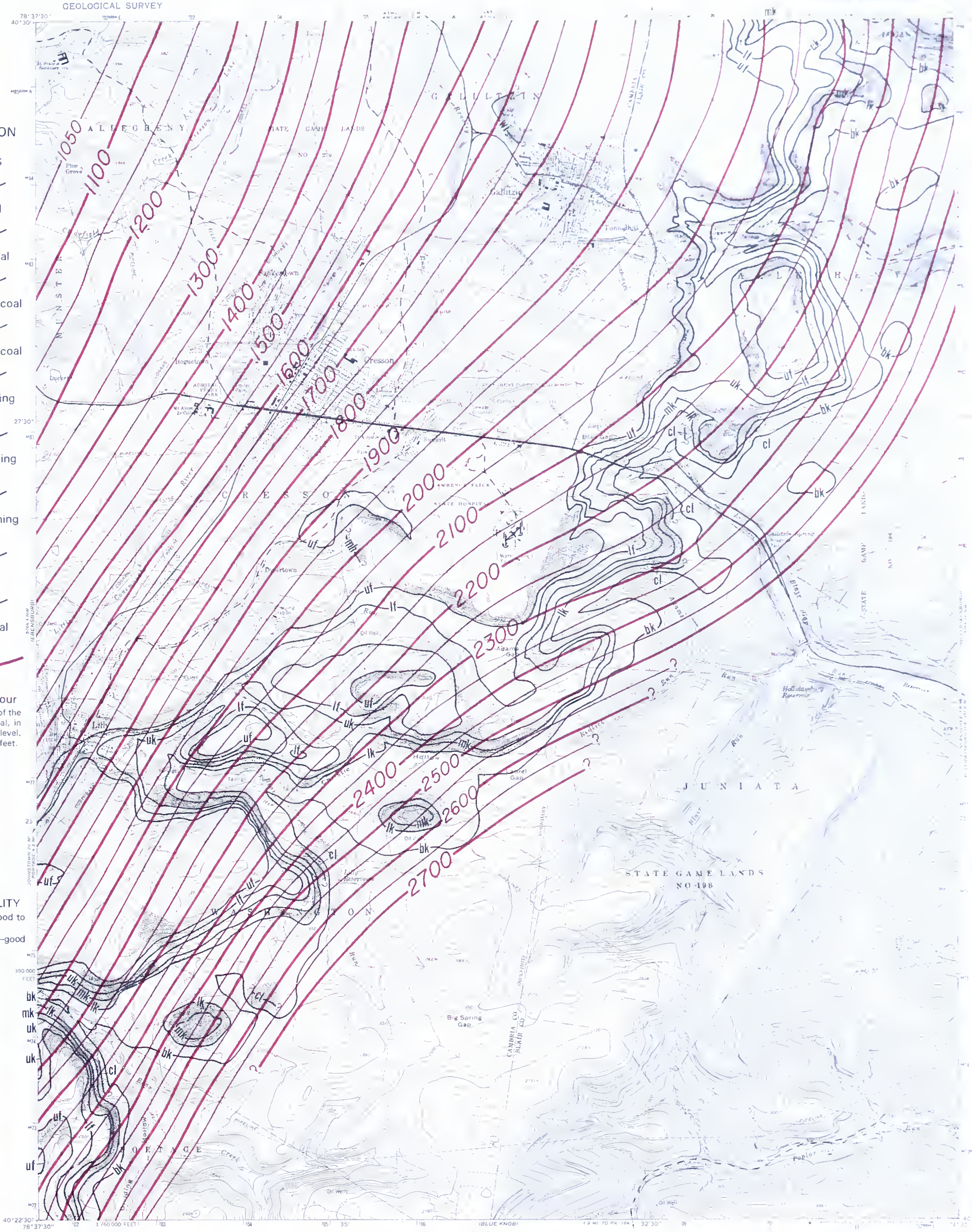
CROP LINES

- wi — Wilgus coal
- mh — Mahoning coal
- uf — Upper Freeport coal
- lf — Lower Freeport coal
- uk — Upper Kittanning coal
- mk — Middle Kittanning coal
- lk — Lower Kittannning coal
- cl — Clarion coal
- bk — Brookville coal

—2000— Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines–good to very good
Structure contours–good to very good



SCALE 1:62500
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOURCES

Crop lines of the Clarion, Middle Kittanning, Lower Freeport, Mahoning, and Wilgus coals by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., unpublished data, and locations of strip mines on topographic map. Other crop lines and structure contours modified by A. D. Glover from Butts (1905) using unpublished data and locations of strip mines on topographic map.

COAL CROP LINES AND STRUCTURE CONTOURS

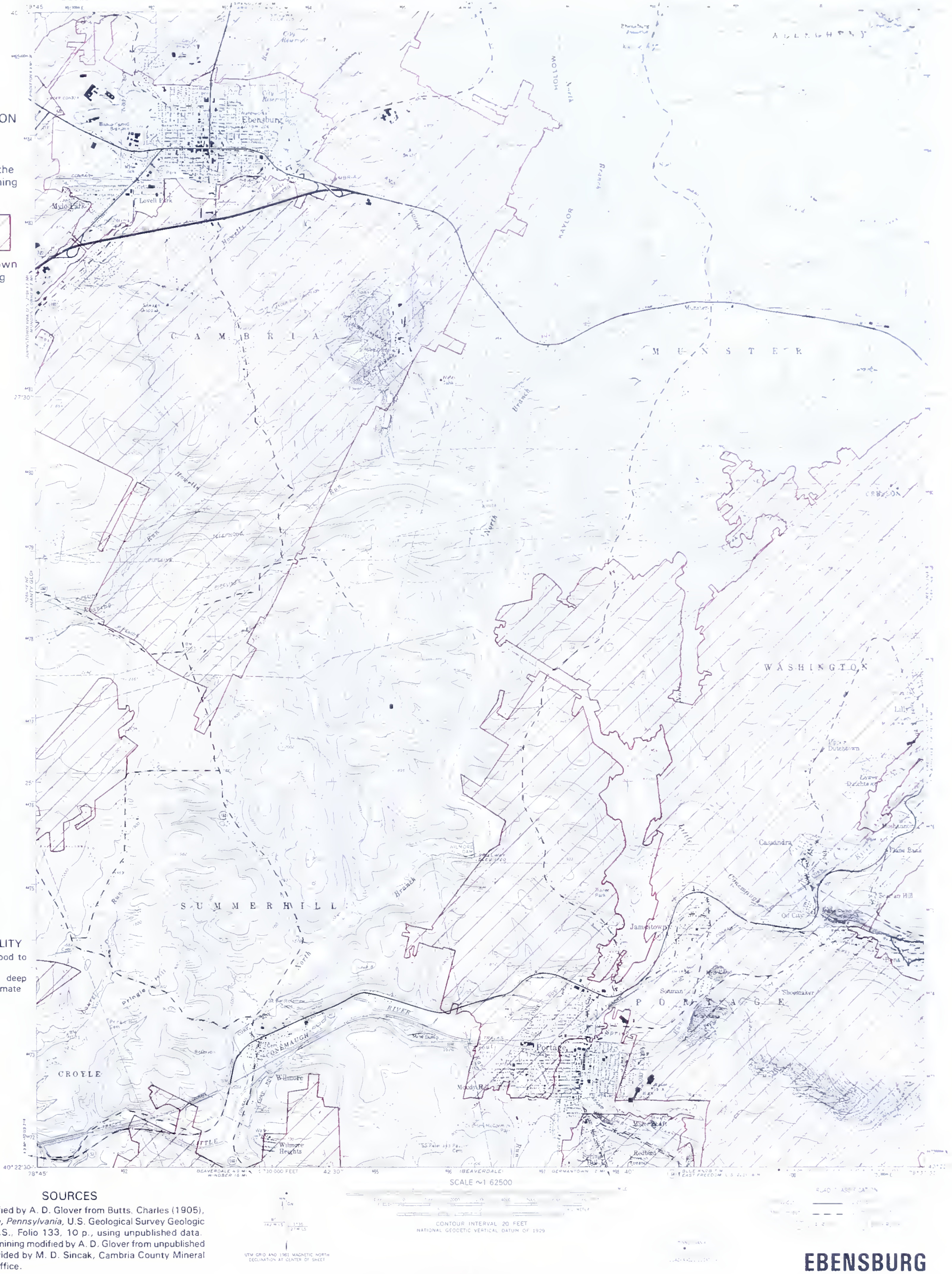
CRESSON

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Kittanning coal

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data. Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

EBENSBURG

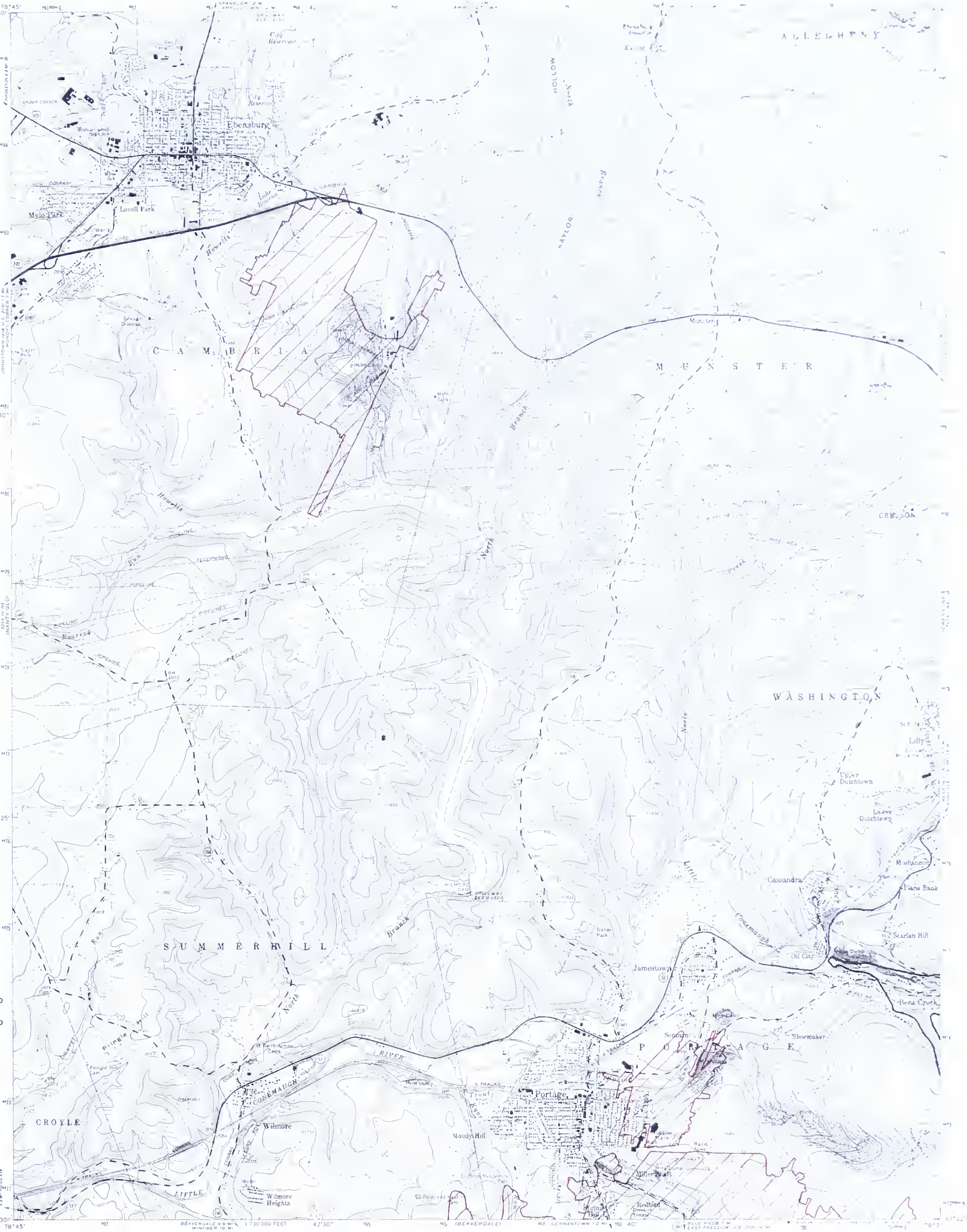
CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Upper Kittanning coal

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data. Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

EBENSBURG

CROP LINE AND MINED-OUT AREAS OF THE
UPPER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

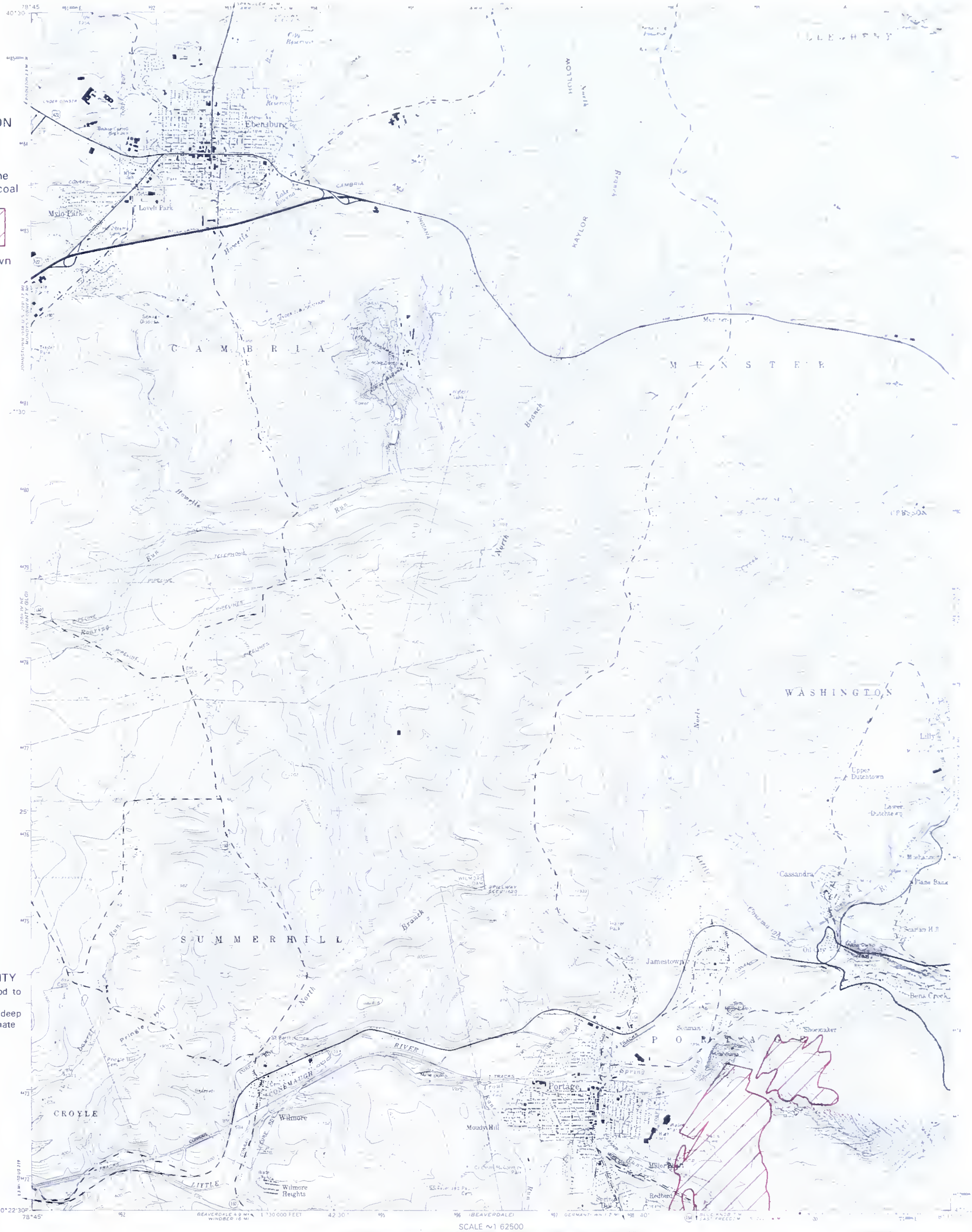
Crop line of the Lower Freeport coal

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known deep mining--approximate



SCALE 1:62 500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOURCES

Crop line by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., and unpublished data.
Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

EBENSBURG

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

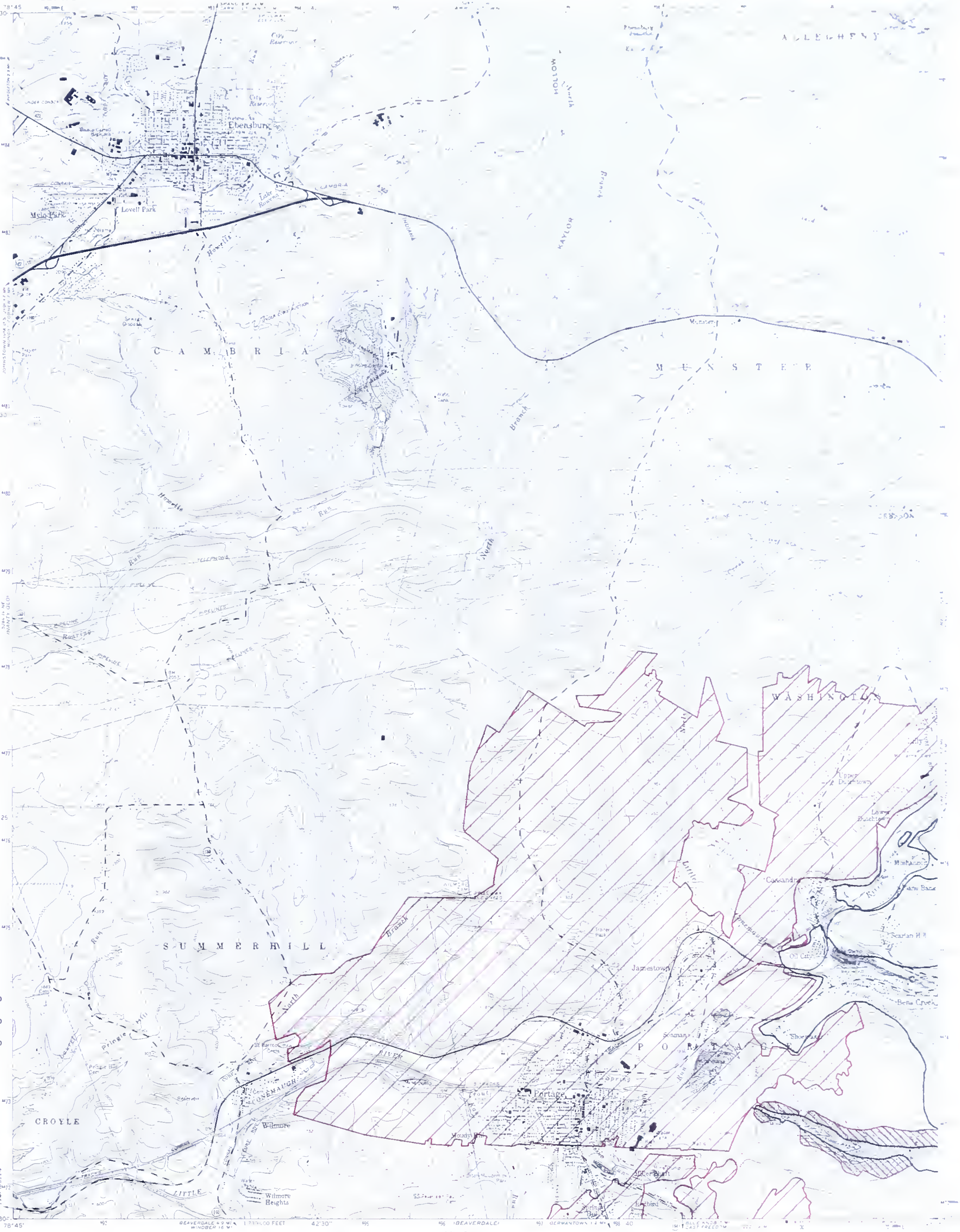
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

EBENSBURG

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

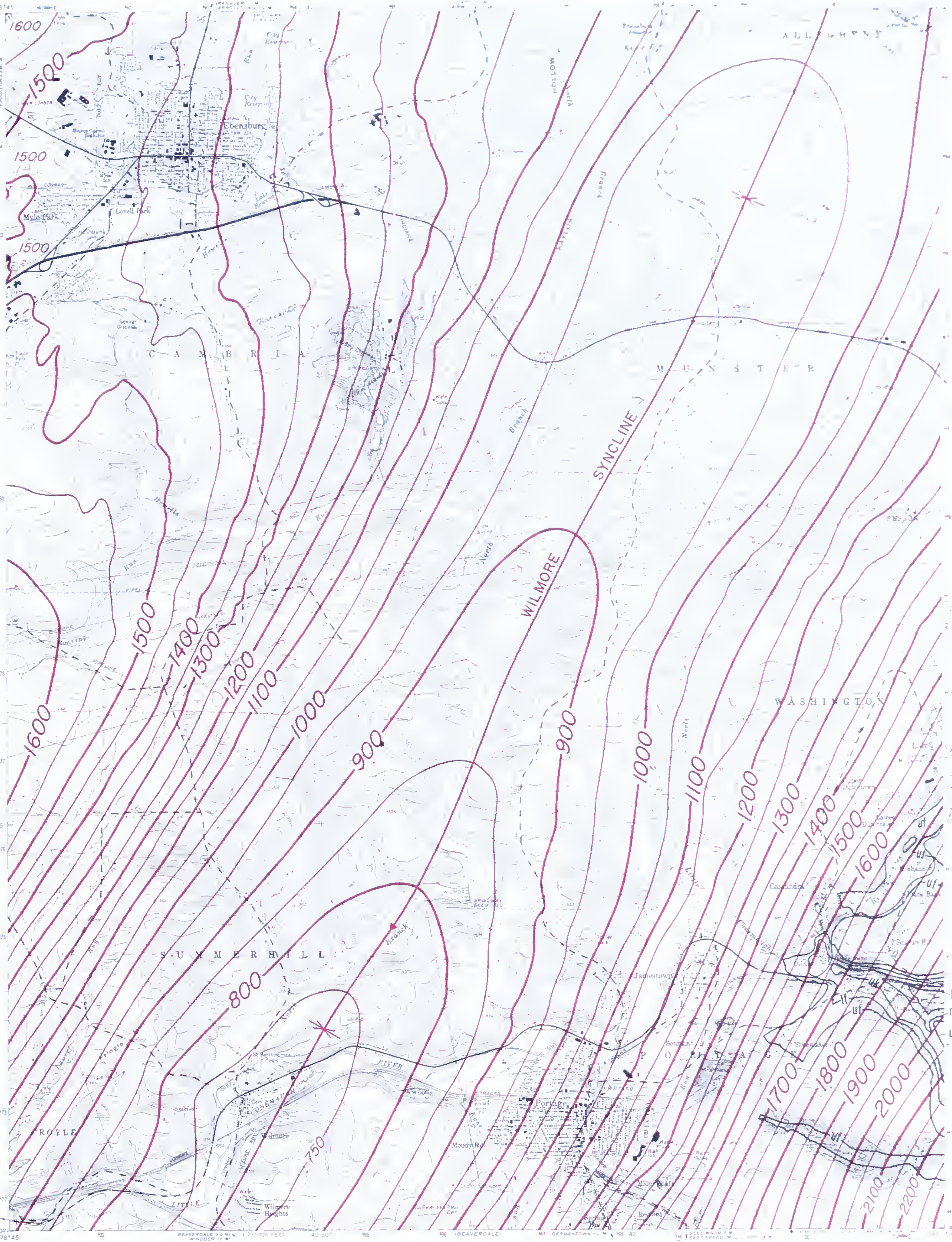
EXPLANATION

CROP LINES

- uf — Upper Freeport coal
- lf — Lower Freeport coal
- uk — Upper Kittanning coal
- mk — Middle Kittanning coal
- lk — Lower Kittanning coal

Syncline
Showing axial-plane trace and direction of plunge.

1000 — Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.



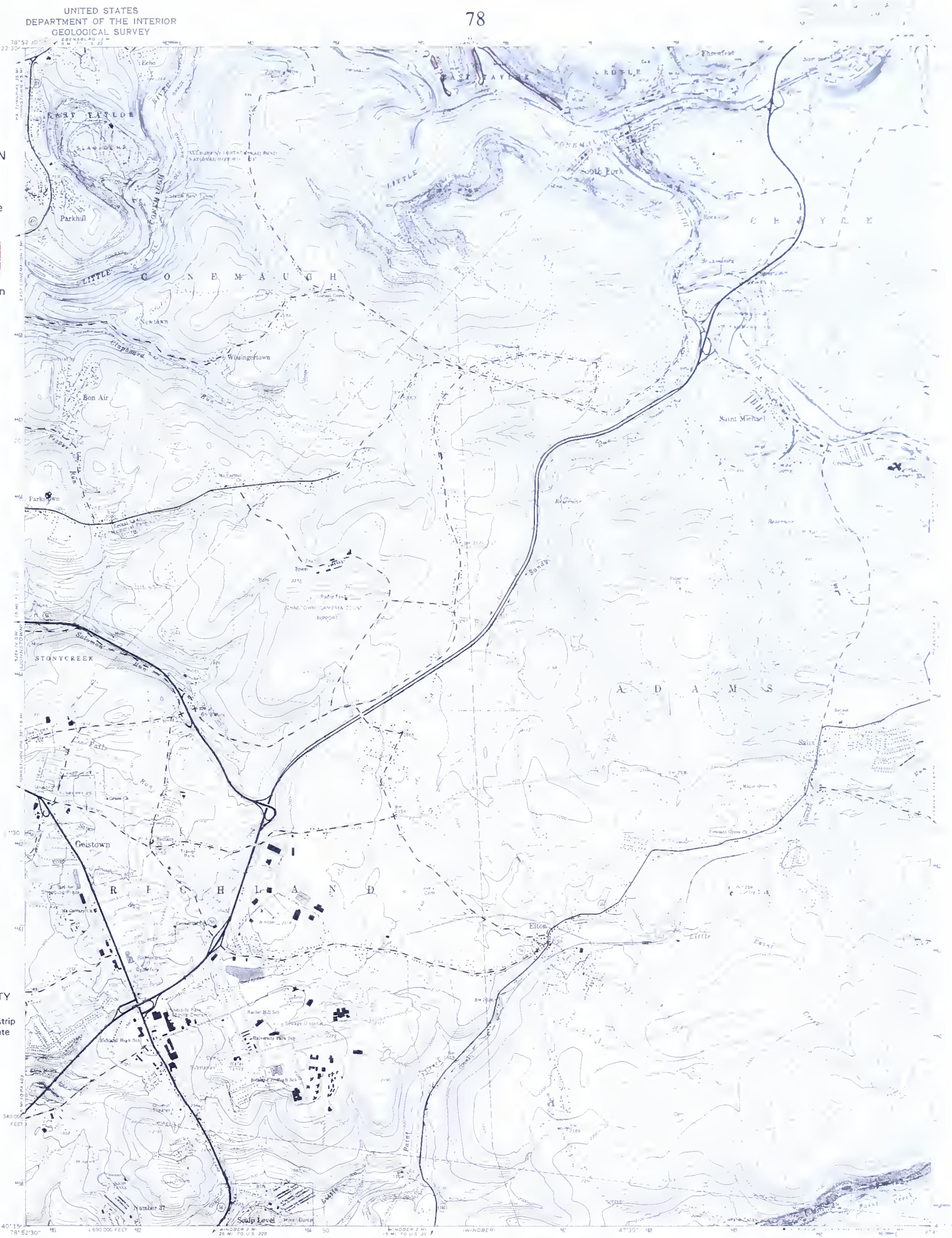
MAP RELIABILITY
Coal crop lines--good to very good
Structure contours--good to very good

SOURCES

Crop lines of the Middle Kittanning and Lower Freeport coals by A. D. Glover based on Butts, Charles (1905), *Ebensburg folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 133, 10 p., and unpublished data.
Other crop lines and structure contours modified by A. D. Glover from Butts (1905) using unpublished data and/or locations of strip mines on topographic map.

EBENSBURG

COAL CROP LINES AND STRUCTURE CONTOURS



EXPLANATION

Crop line of the Mercer coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good
Limits of known strip mining--approximate

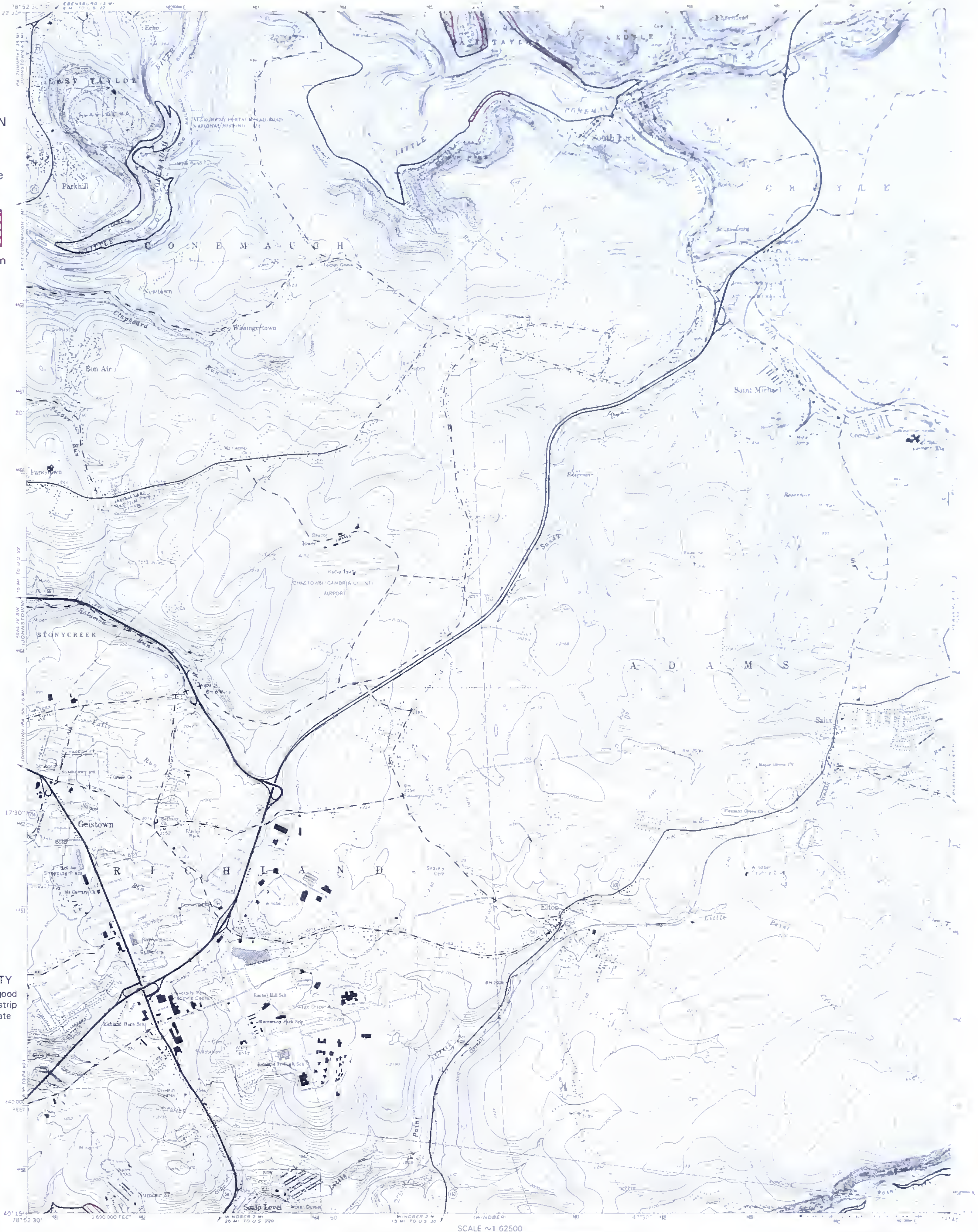
SOURCES

Crop line by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

GEISTOWN

CROP LINE AND MINED-OUT AREAS OF THE
MERCER COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

～ Crop line of the Brookville coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--very good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

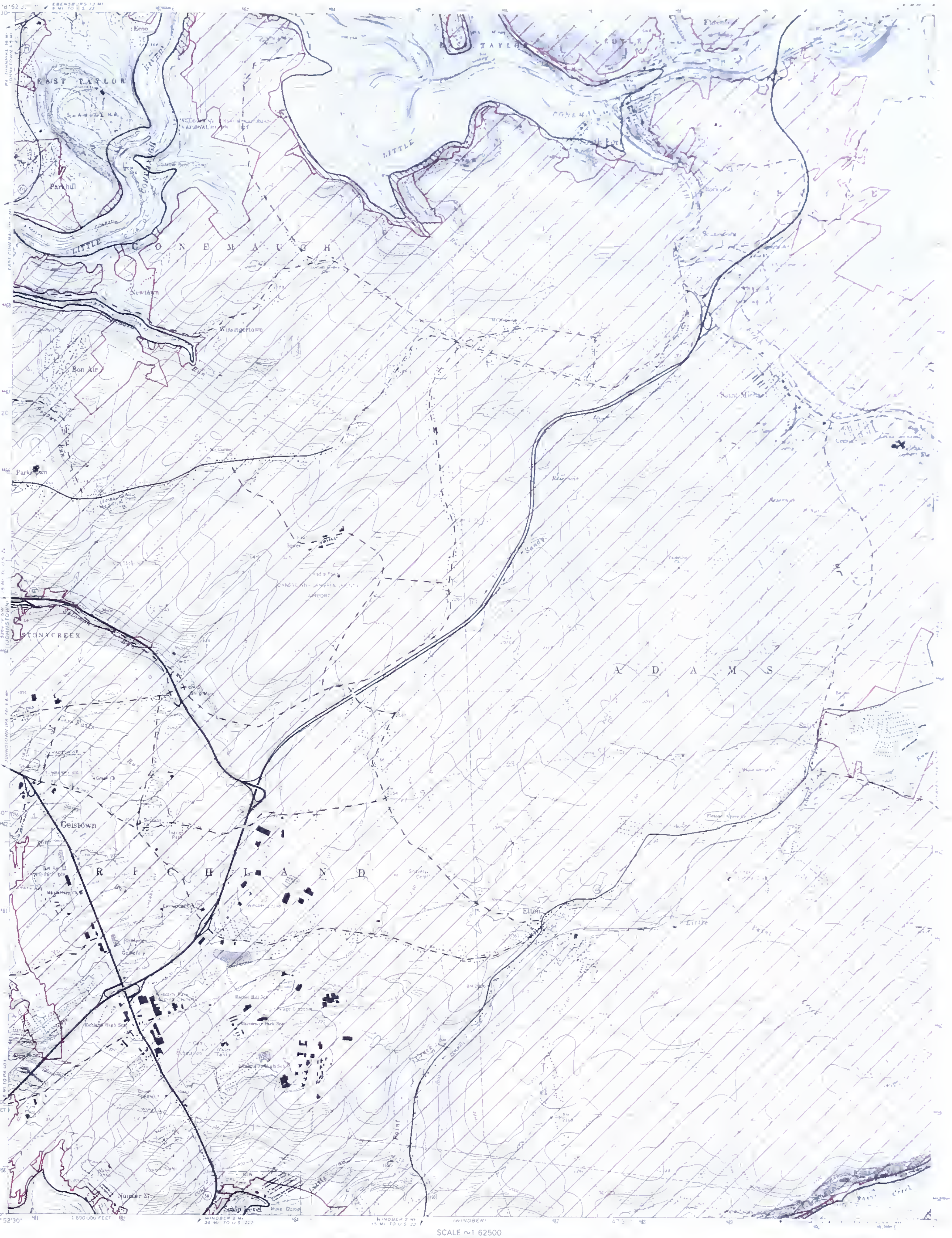
GEISTOWN

CROP LINE AND MINED-OUT AREAS OF THE
BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

- Crop line of the Lower Kittanning coal
- ▨ Extent of known strip mining
- ▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

GEISTOWN

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

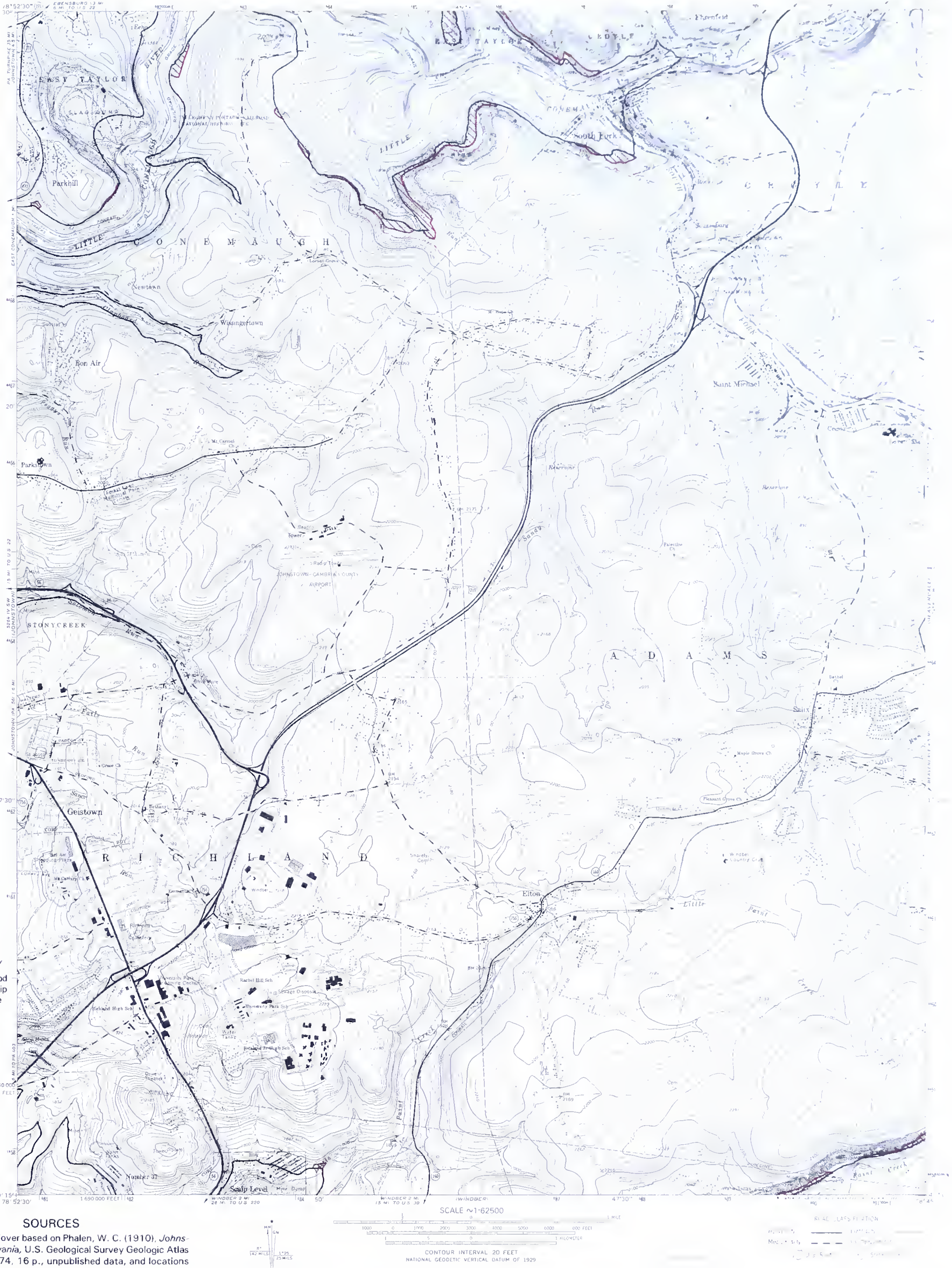
EXPLANATION

Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--very good
Limits of known strip mining--approximate



SOURCES

Crop line by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

GEISTOWN

CROP LINE AND MINED-OUT AREAS OF THE
MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

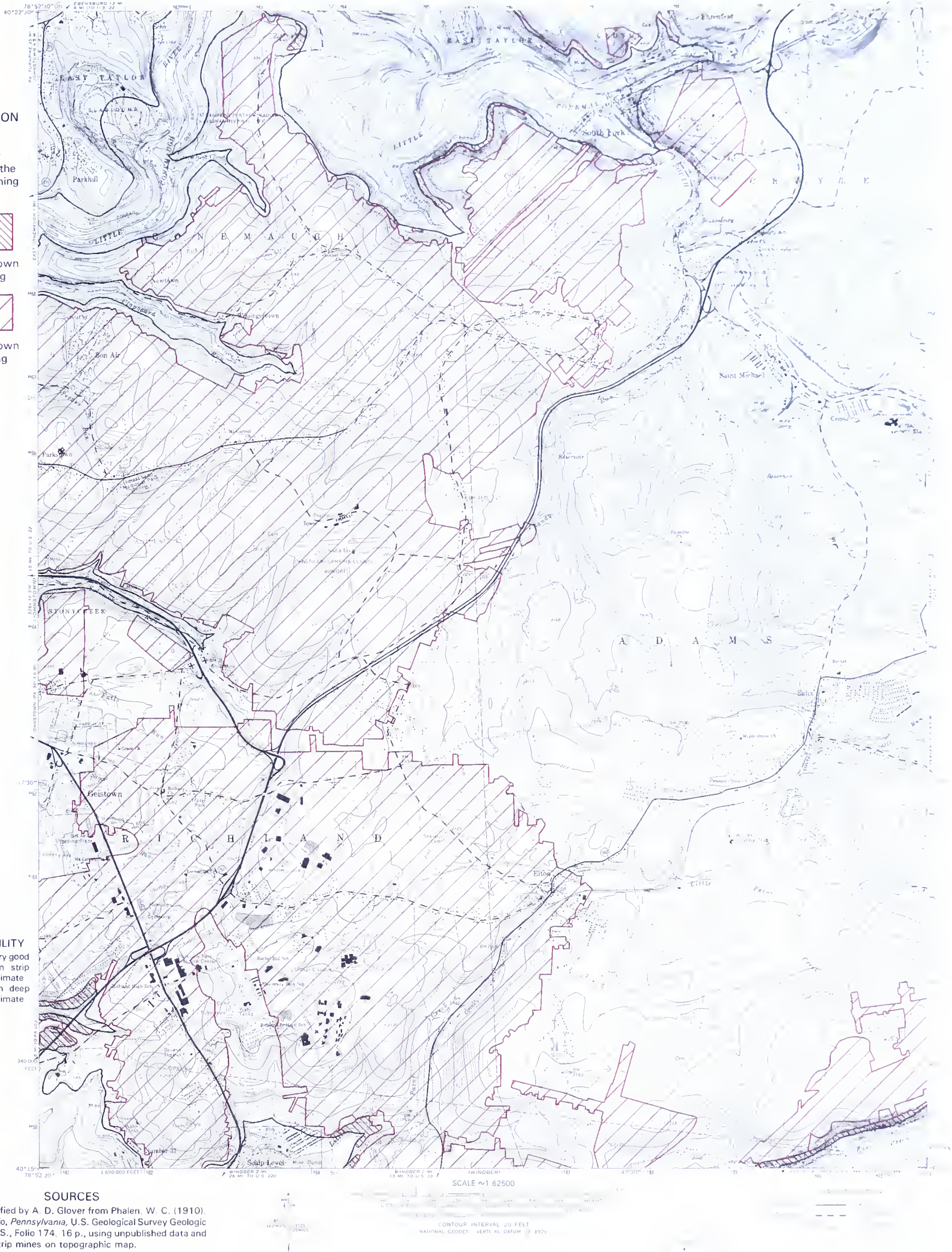
〰 Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate



SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.
Limits of deep mining modified by A. D. Glover from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

GEISTOWN

CROP LINE AND MINED-OUT AREAS OF THE UPPER KITTANNING COAL

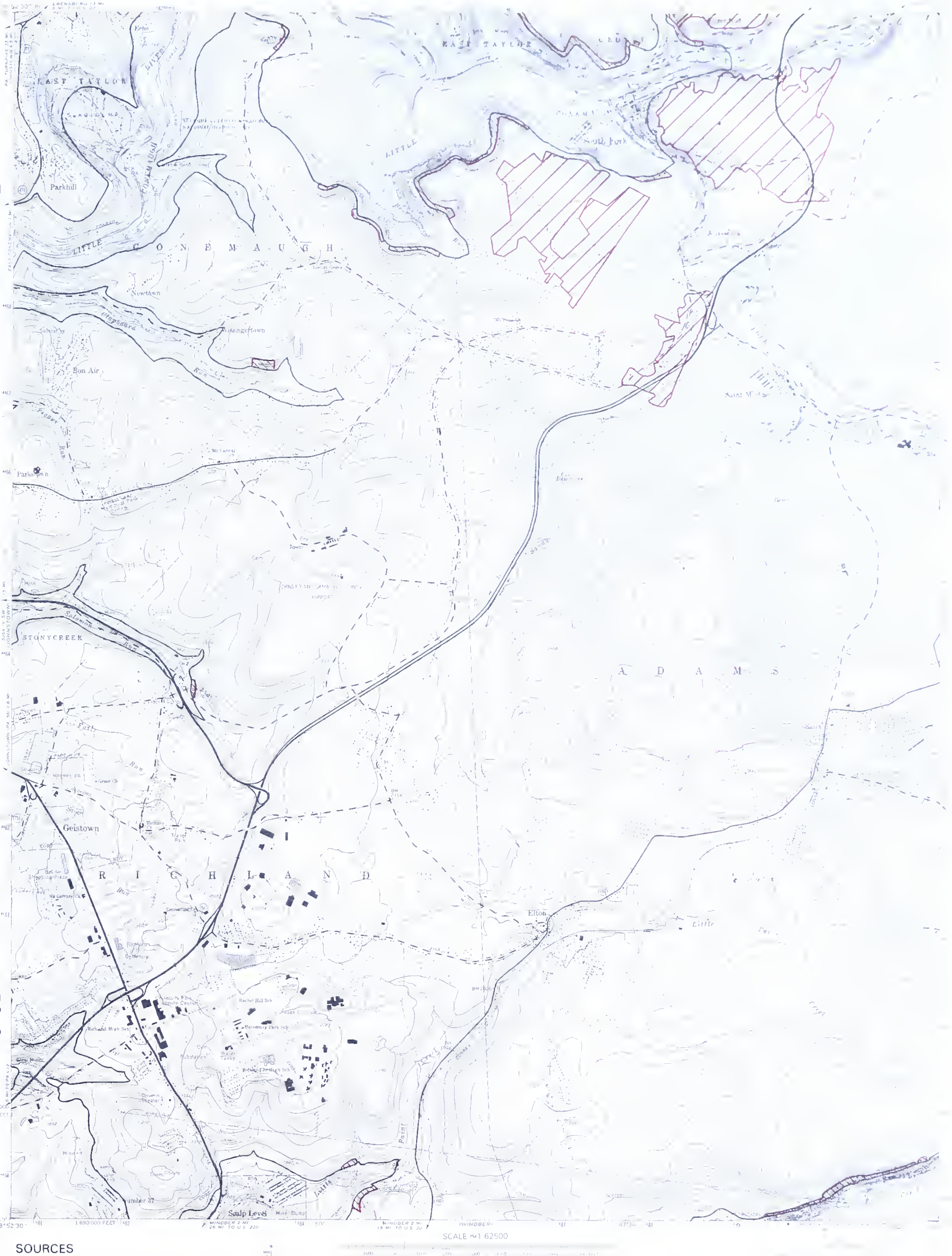
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

GEISTOWN

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

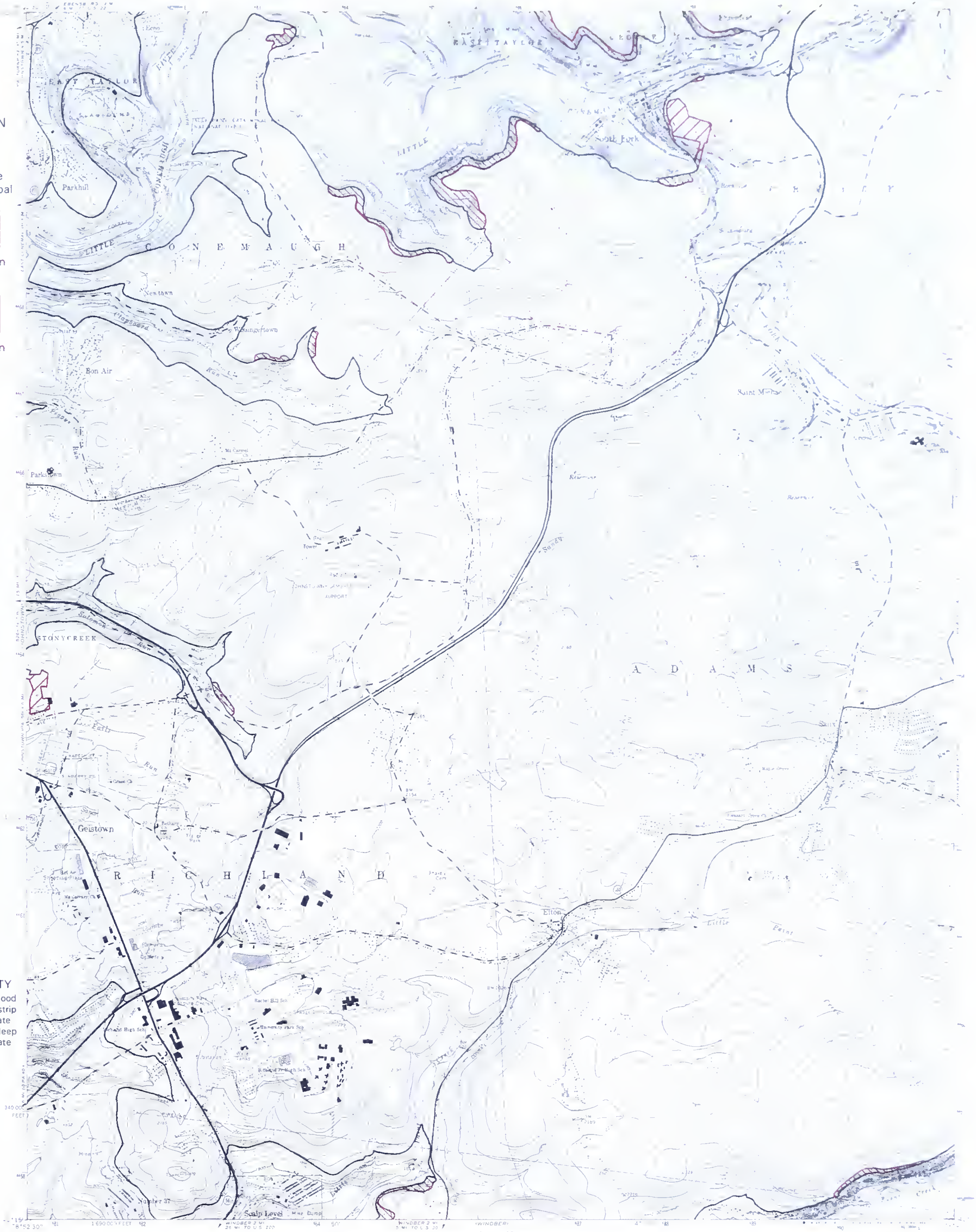
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

GEISTOWN

CROP LINE AND MINED-OUT AREAS OF THE

UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

bc
Brush Creek coal

uf
Upper Freeport coal

lf
Lower Freeport coal

uk
Upper Kittanning coal

mk
Middle Kittanning coal

lk
Lower Kittanning coal

bk
Brookville coal

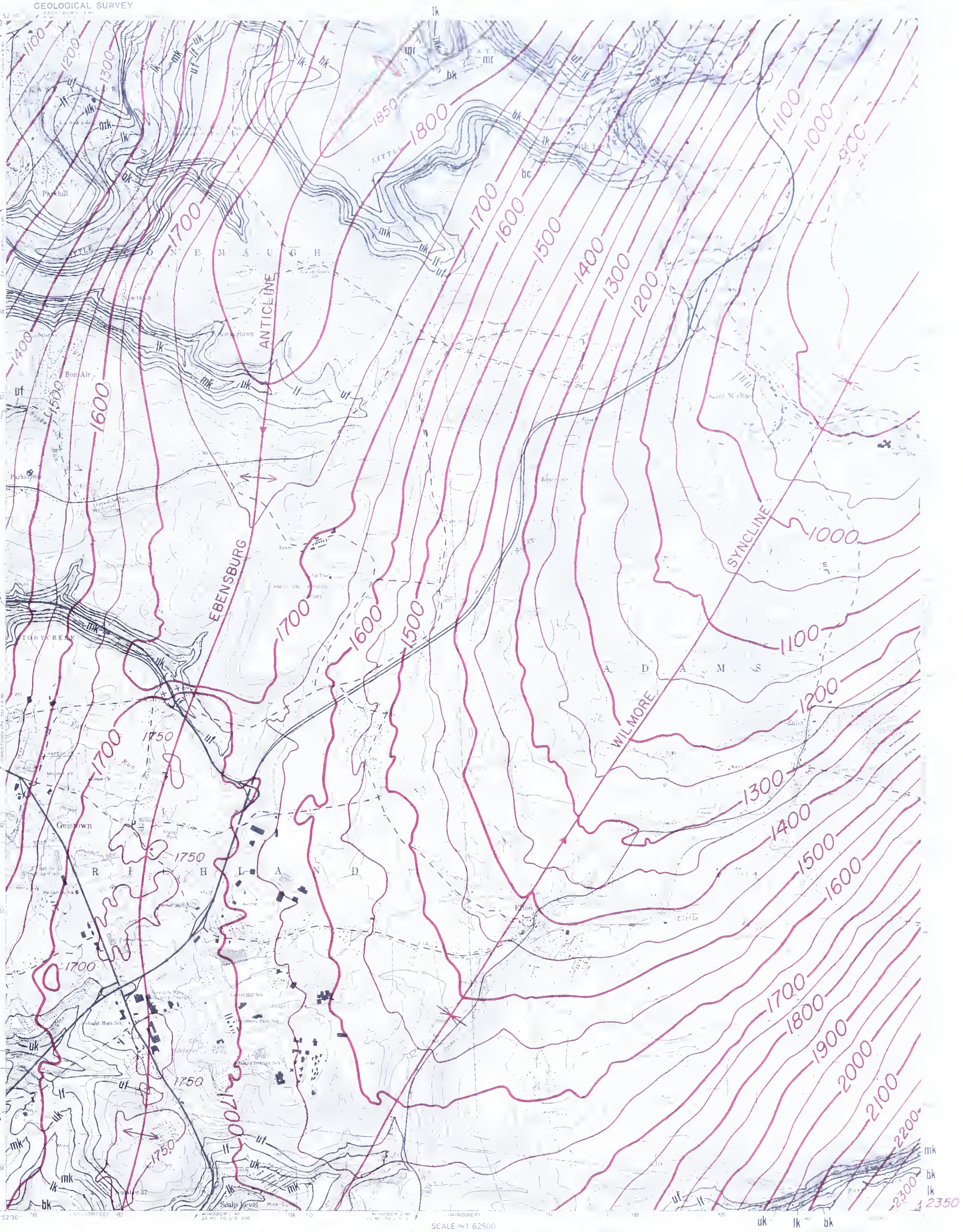
mr
Mercer coal

Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

1500
Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY
Coal crop lines--good to very good
Structure contours--very good



SOURCES

Crop lines of the Mercer, Middle Kittanning, and Brush Creek coals by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, and locations of strip mines on topographic map.
Other crop lines and structure contours modified by A. D. Glover from Phalen (1910) using unpublished data and locations of strip mines on topographic map.

GEISTOWN

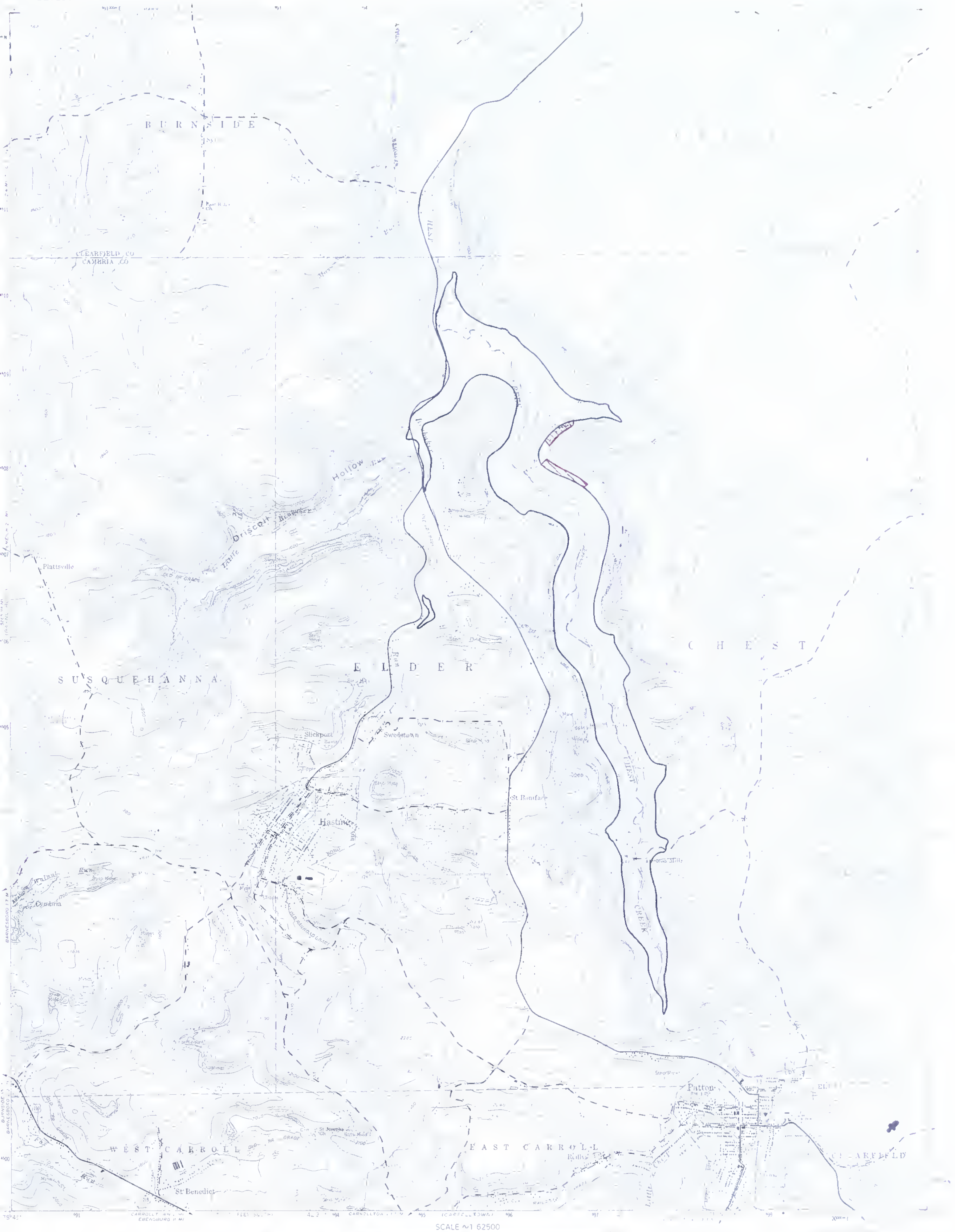
COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Brookville coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

HASTINGS

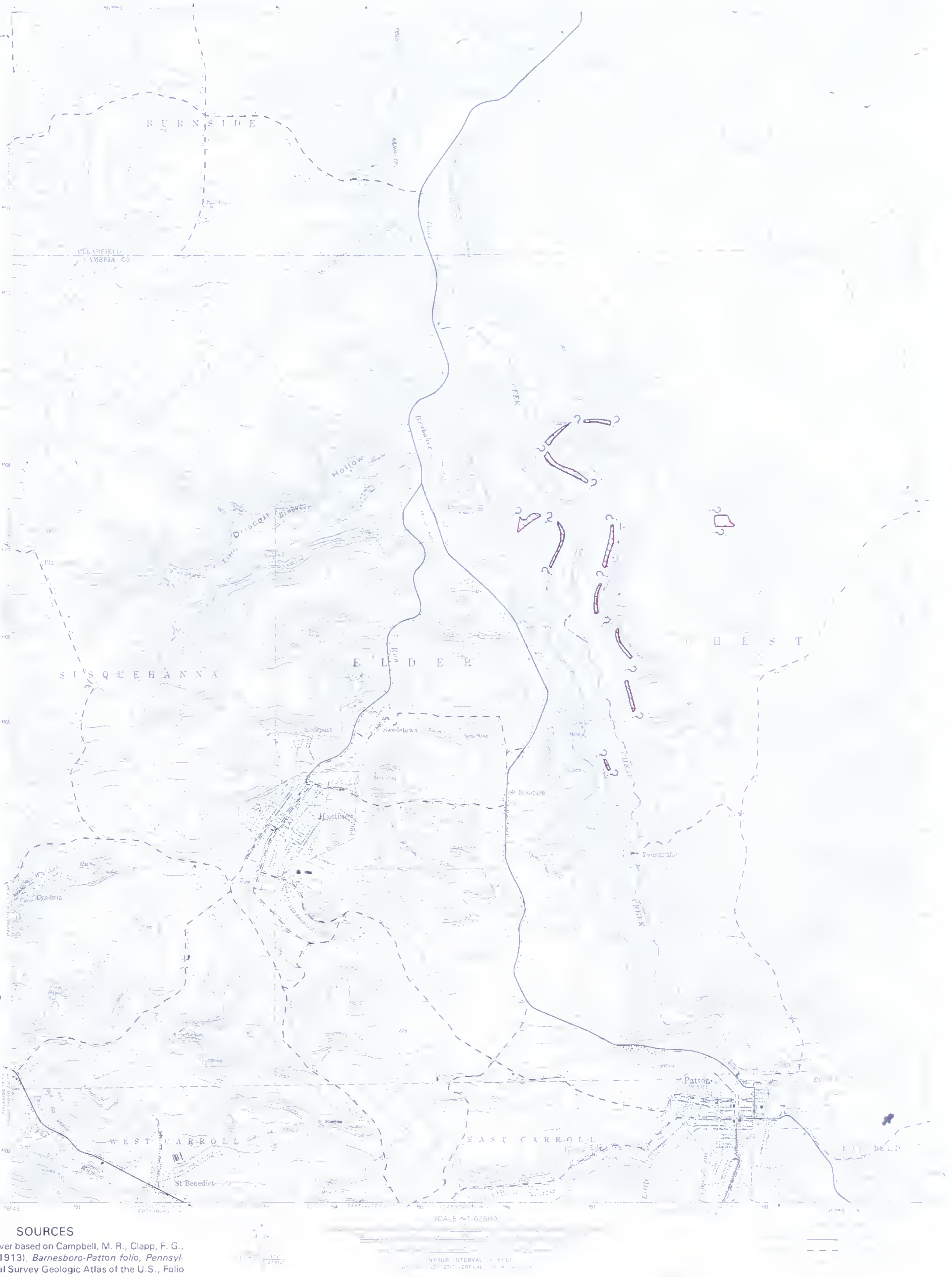
CROP LINE AND MINED-OUT AREAS OF THE BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

— Crop line of the Clarion coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good
Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., and locations of strip mines on topographic map. Limits of strip mining based on interpretation of topographic map.

HASTINGS

CROP LINE AND MINED-OUT AREAS OF THE

CLARION COAL

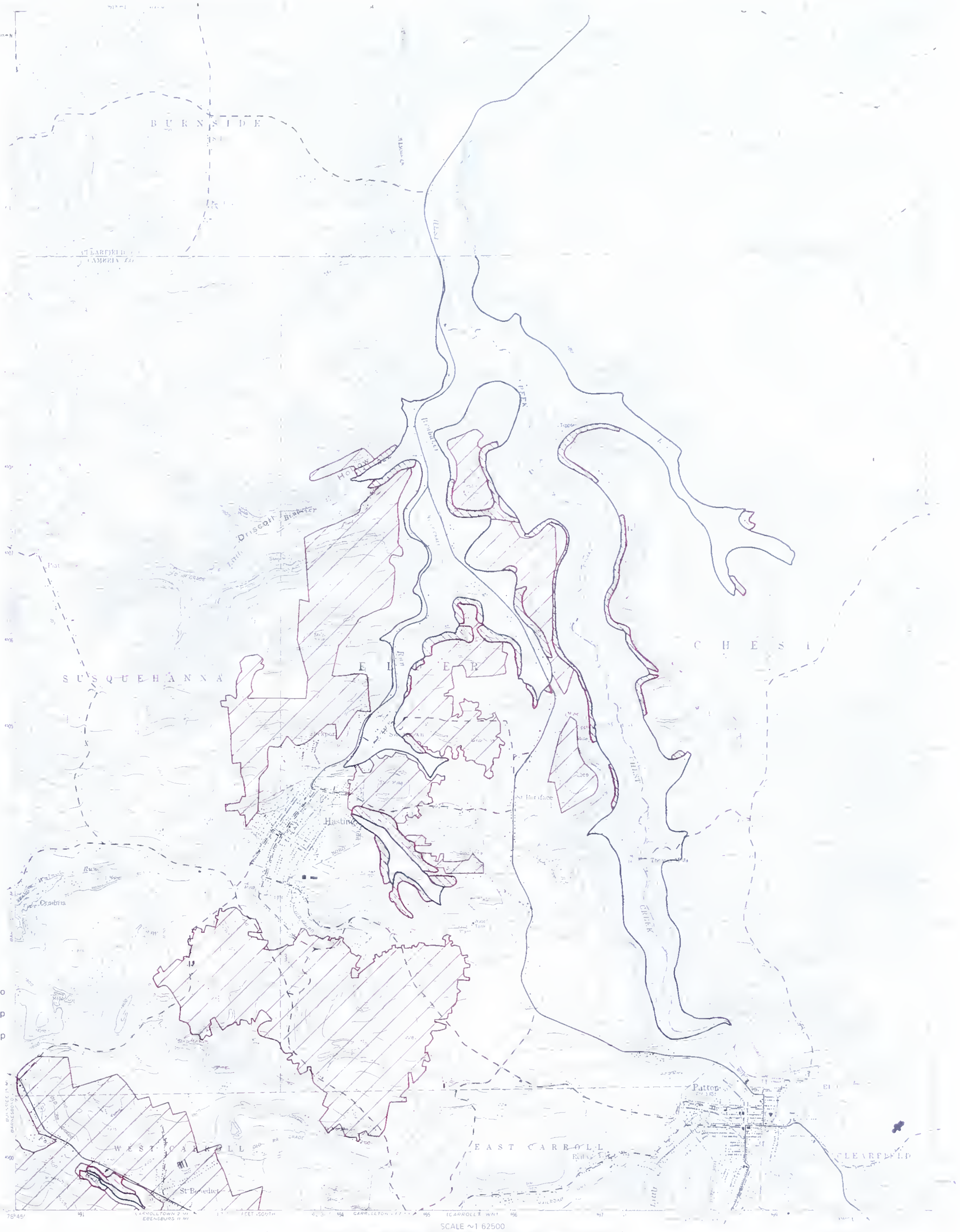
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

HASTINGS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

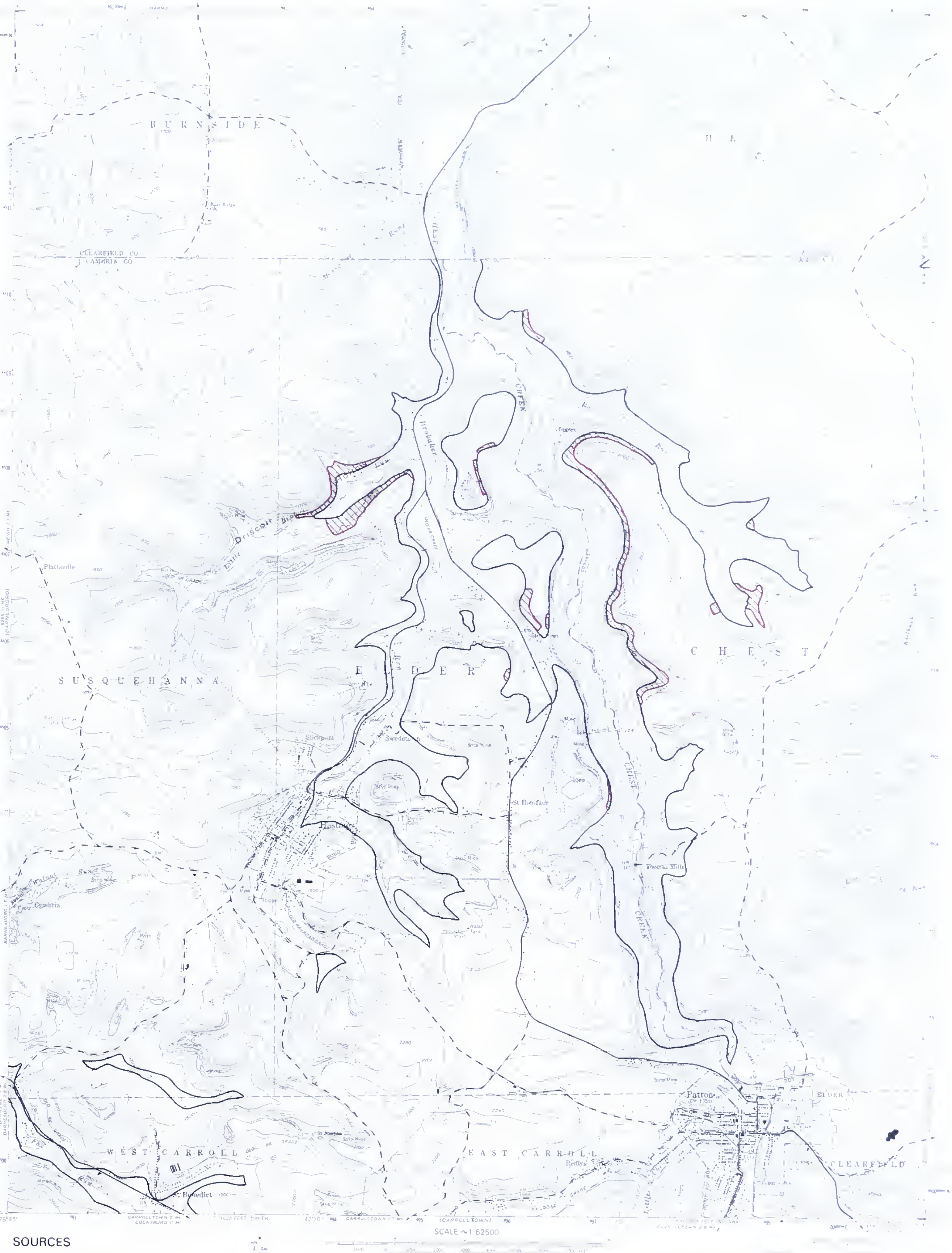
〰 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate



SOURCES

Crop line by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

HASTINGS

CROP LINE AND MINED-OUT AREAS OF THE
MIDDLE KITTANNING COAL

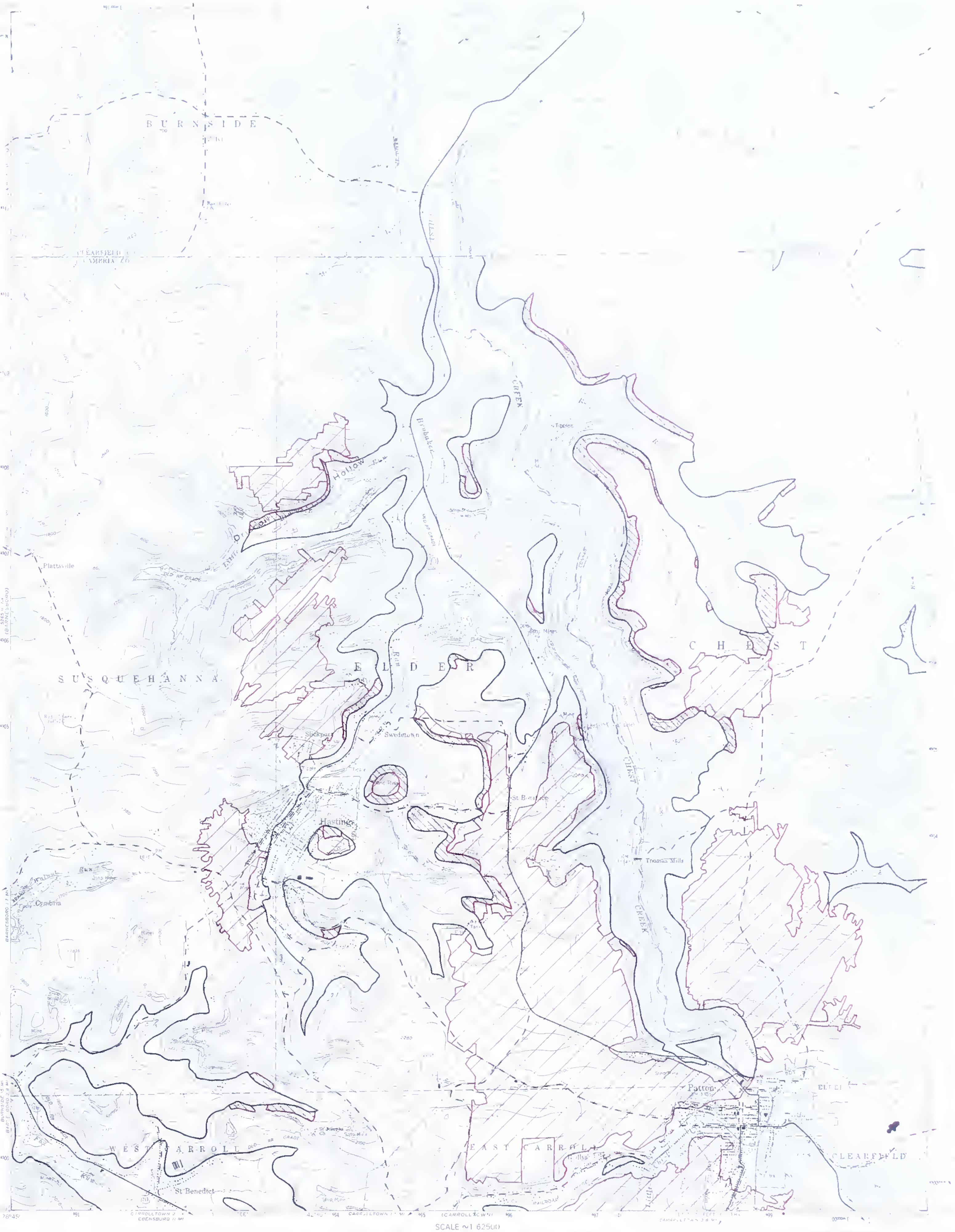
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CROP LINE AND MINED-OUT AREAS OF THE
UPPER KITTANNING COAL

HASTINGS

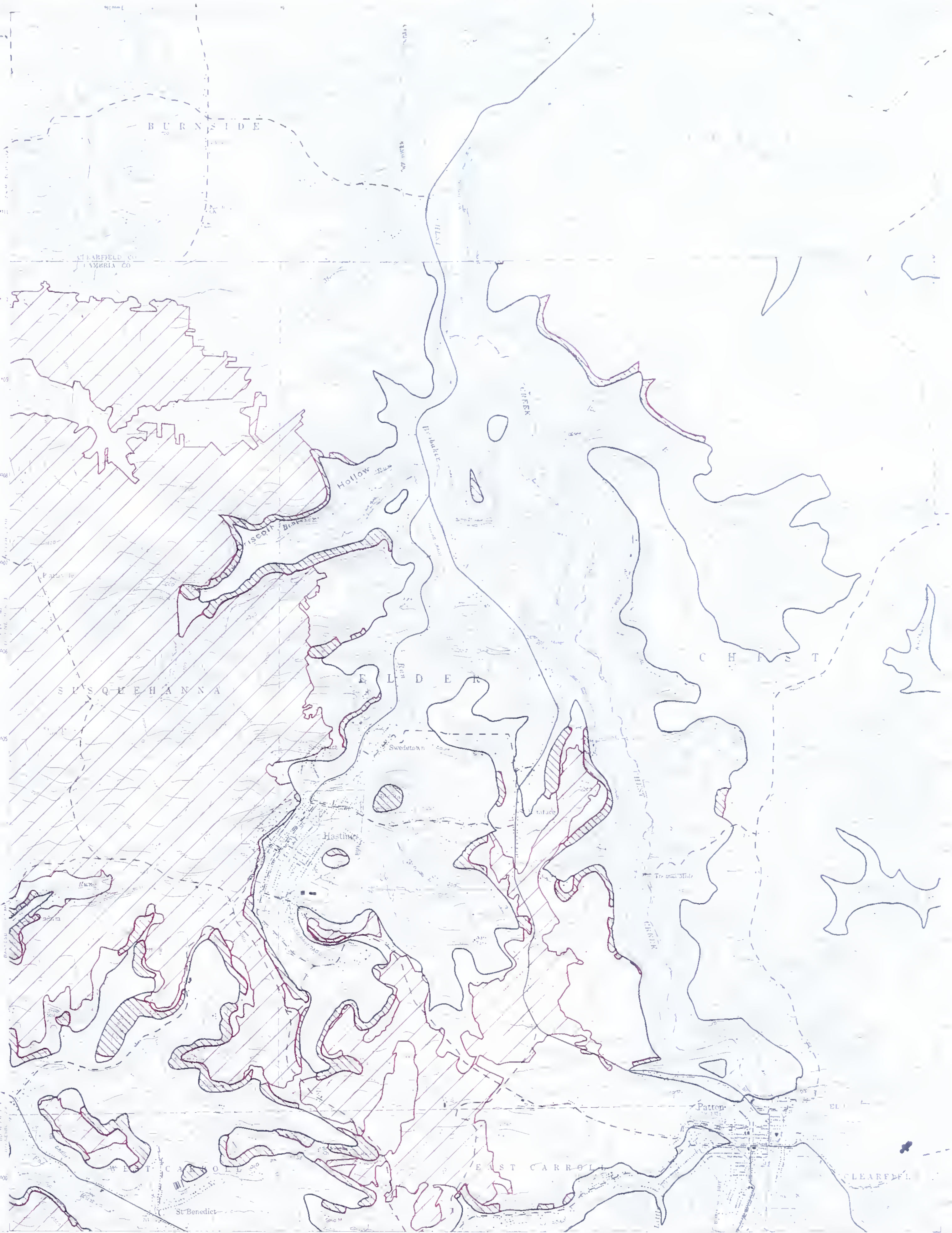
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Lower Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

HASTINGS

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

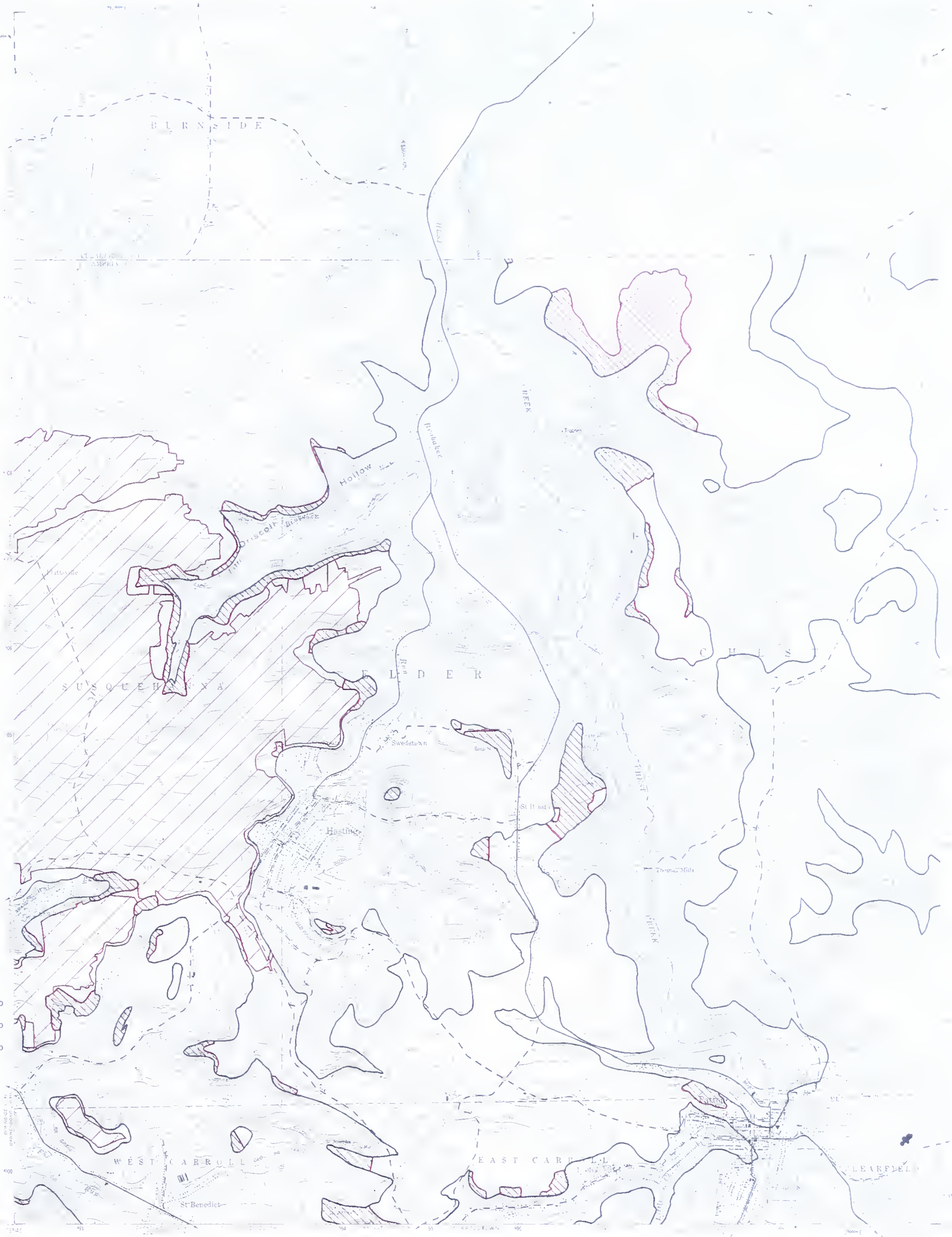
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Upper Freeport coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data and locations of strip mines on topographic map.

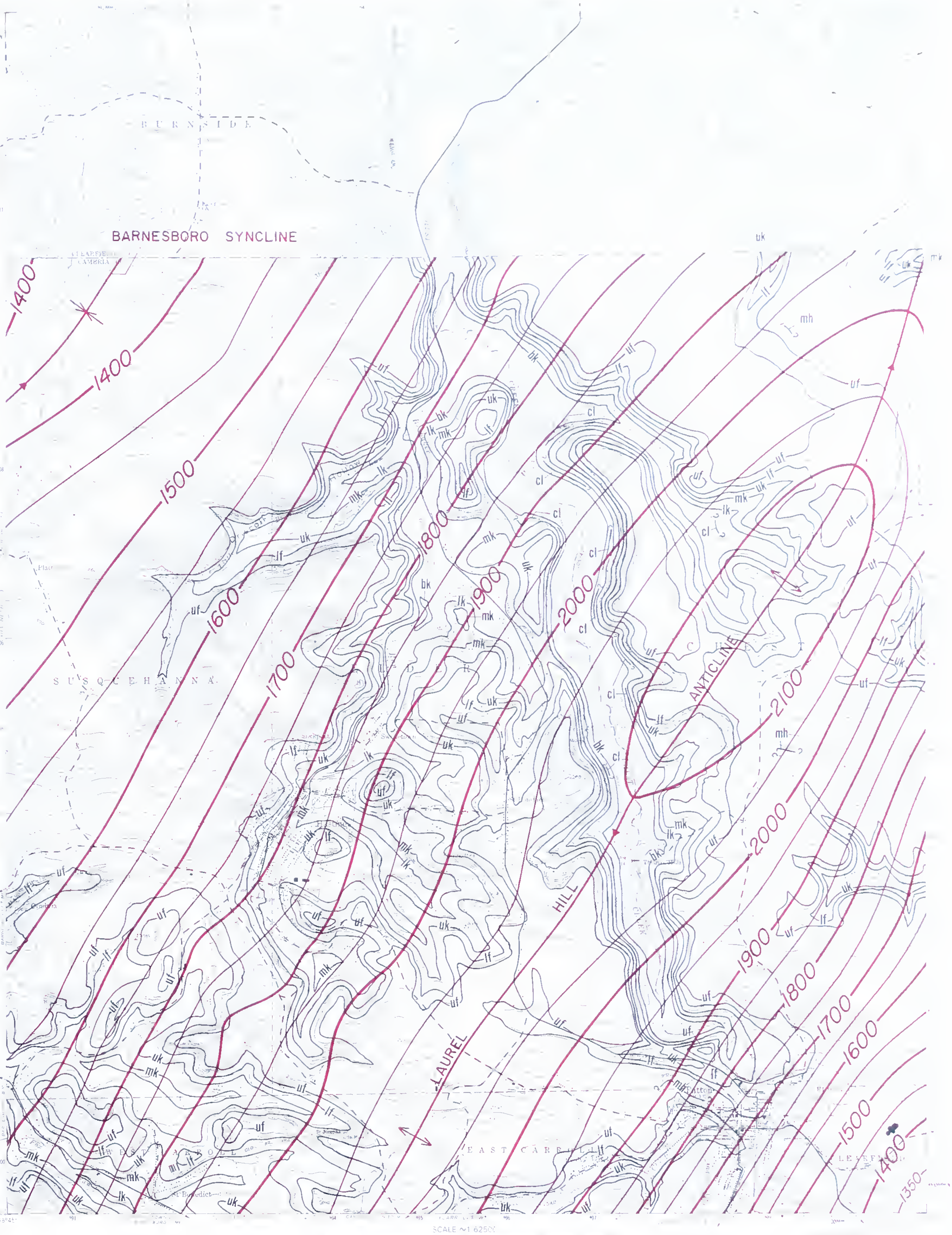
Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

HASTINGS

CROP LINE AND MINED-OUT AREAS OF THE UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

CROP LINES

—mh— Mahoning coal

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—cl— Clarion coal

—bk— Brookville coal

Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

—2000—
Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet

MAP RELIABILITY

Coal crop lines–good to very good
Structure contours–good to very good

SOURCES

Crop lines of the Clarion, Middle Kittanning, and Mahoning coals by A. D. Glover based on Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., unpublished data, and locations of strip mines on topographic map.
Other crop lines and structure contours modified by A. D. Glover from Campbell and others (1913) using unpublished data and locations of strip mines on topographic map.

HASTINGS

COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

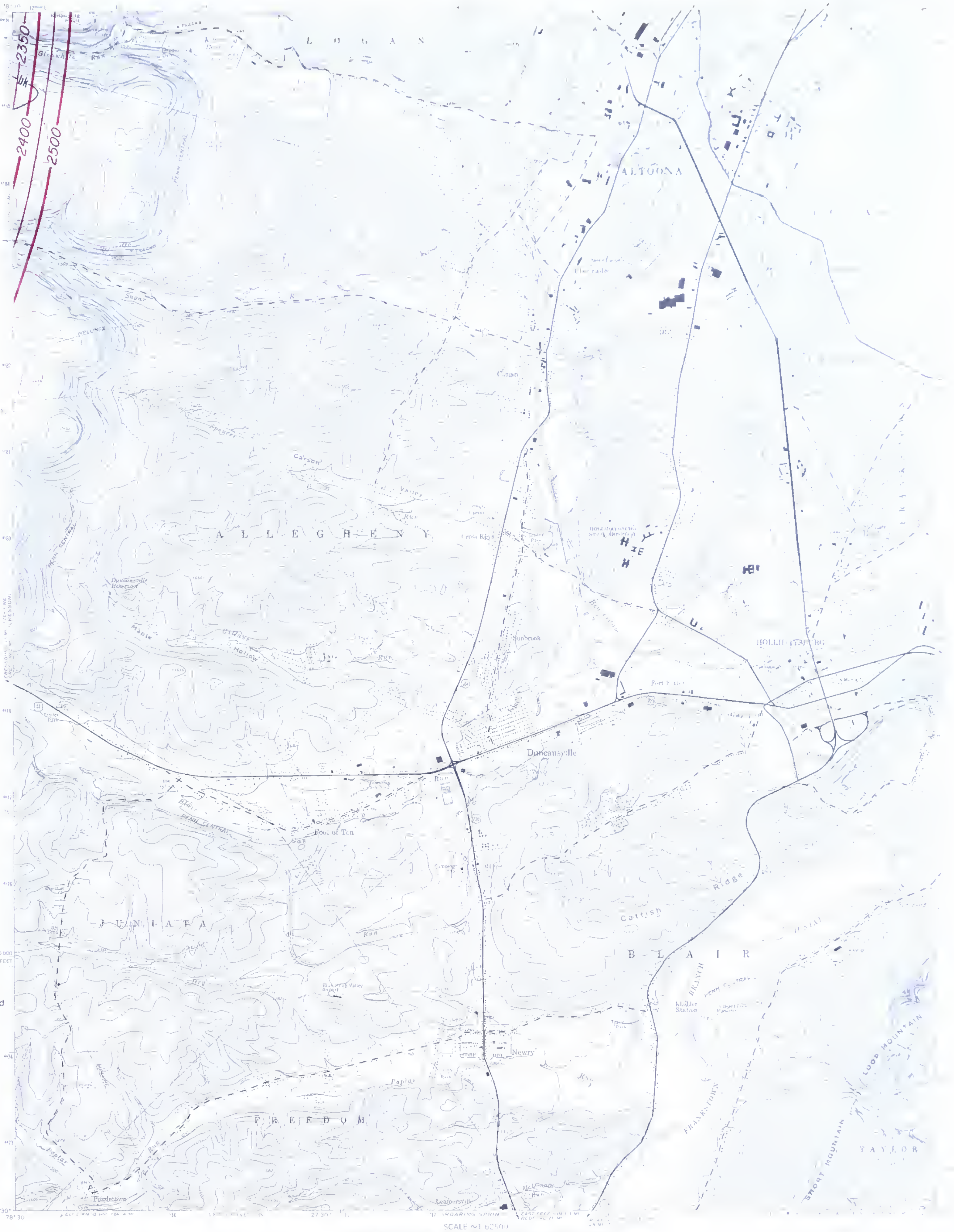
CROP LINE

—— bk ——

Brookville coal

—2500—

Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.



MAP RELIABILITY
Coal crop line--good
Structure contours--good

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOURCES

Crop line and structure contours modified by A. D. Glover from Butts, Charles (1945), *Hollidaysburg-Huntingdon folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 227, 20 p., using unpublished data.

HOLLIDAYSBURG

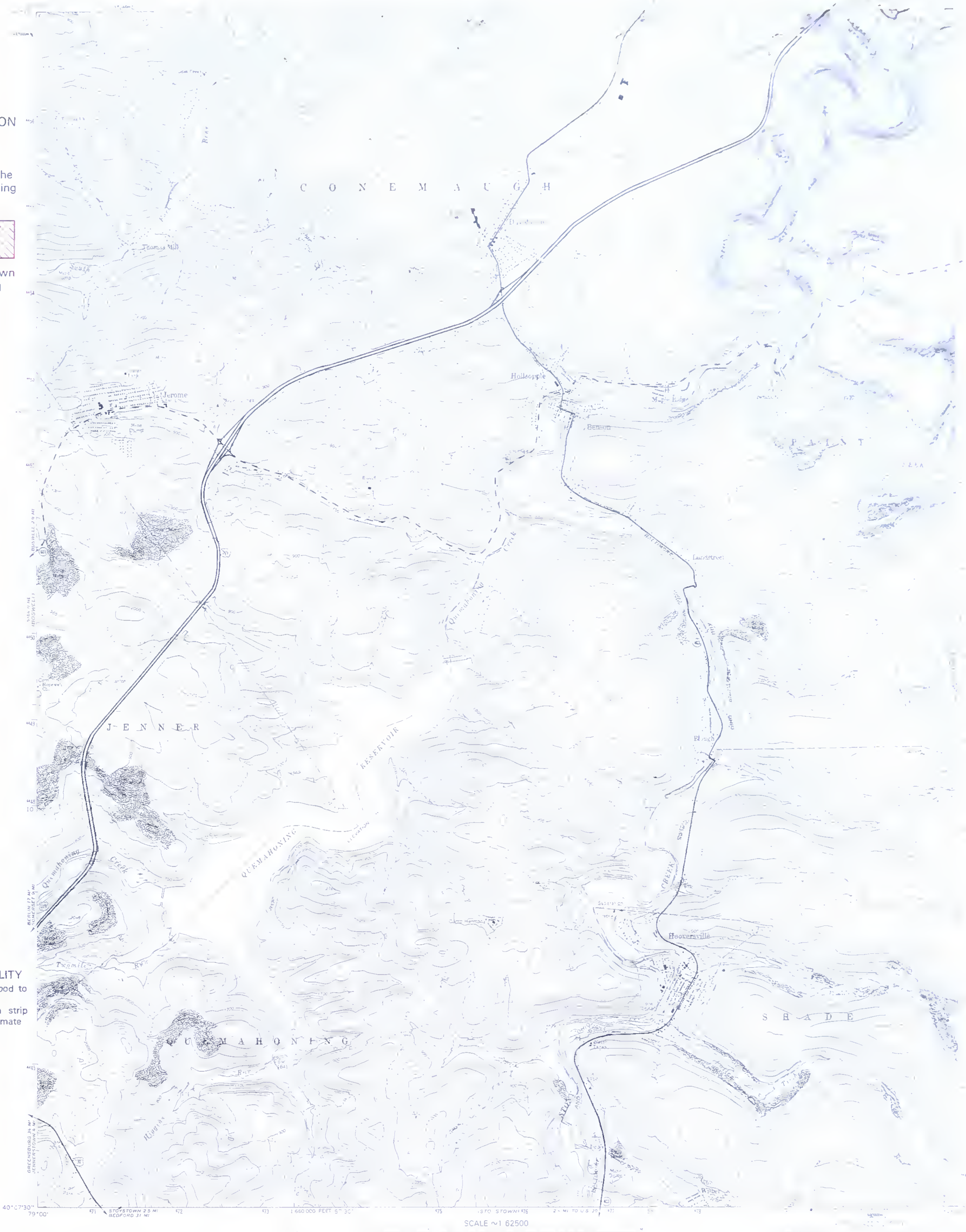
COAL CROP LINE AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

◡ Crop line of the Lower Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on crop line extended from adjacent area (Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*. U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p.) and location of strip mine on topographic map. Limits of strip mining based on interpretation of topographic map.

HOOVERSVILLE

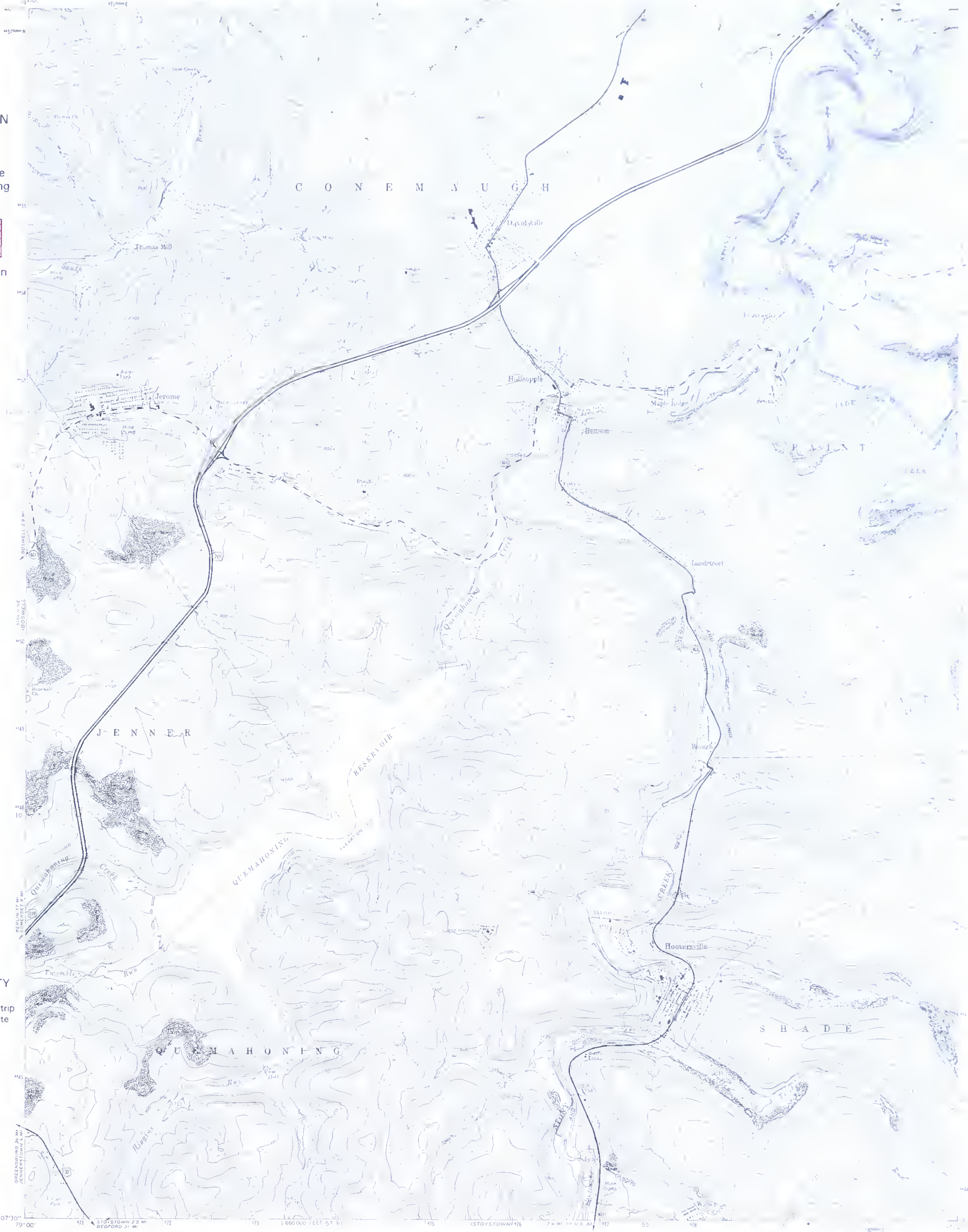
CROP LINE AND MINED-OUT AREA OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Middle Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good
Limits of known strip mining--approximate

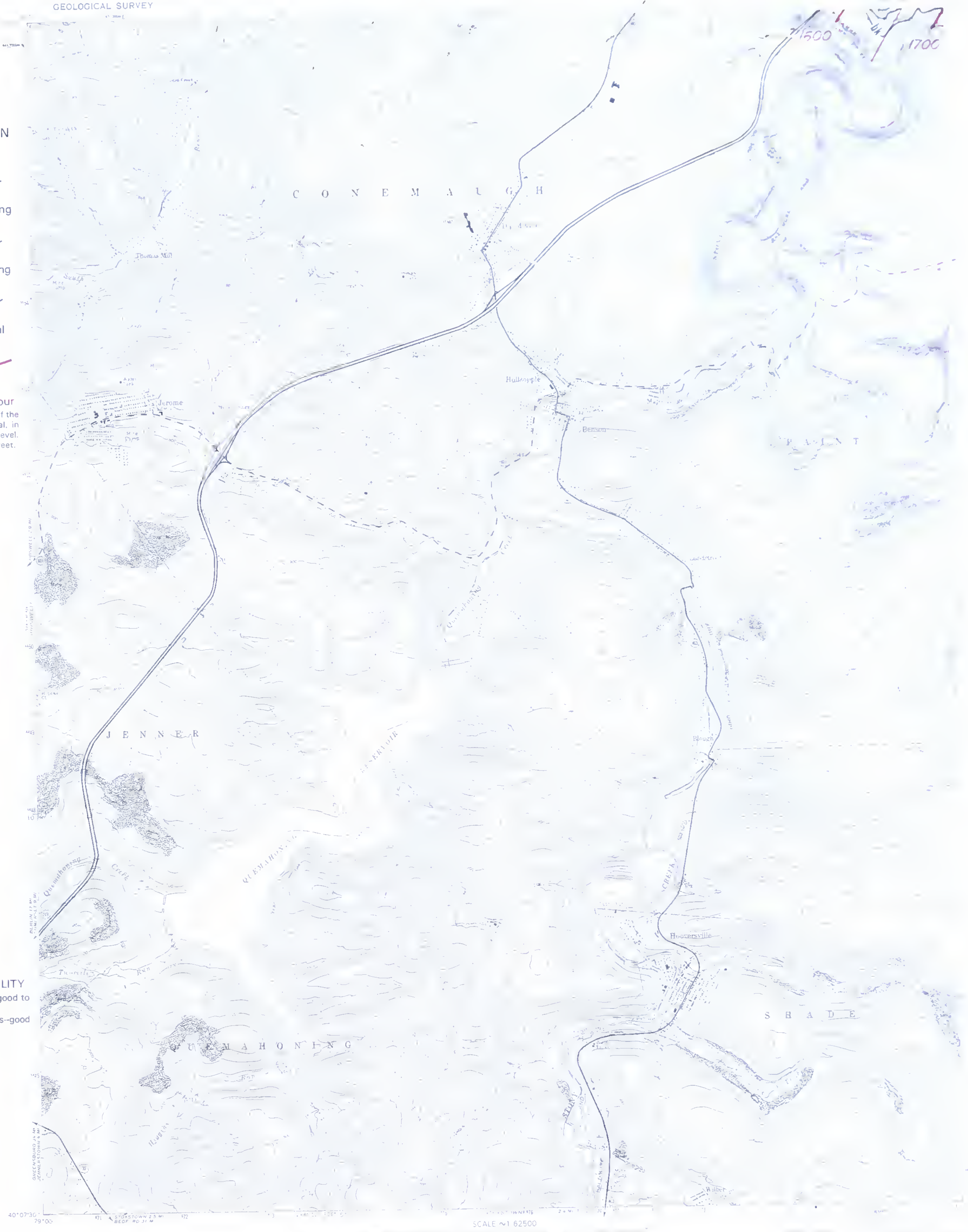
SOURCES

Crop line by A. D. Glover based on location of strip mine on topographic map.
Limits of strip mining based on interpretation of topographic map.

HOOVERSVILLE

CROP LINE AND MINED-OUT AREA OF THE
MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

CROP LINES

mk
Middle Kittanning coal

lk
Lower Kittanning coal

bk
Brookville coal

1700
Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good

SOURCES

Crop line of the Middle Kittanning coal by A. D. Glover based on location of strip mine on topographic map.
Other crop lines and structure contours by A. D. Glover based on crop lines and structure contours extended from adjacent area (Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p.), and locations of strip mines on topographic map.

HOOVERSVILLE

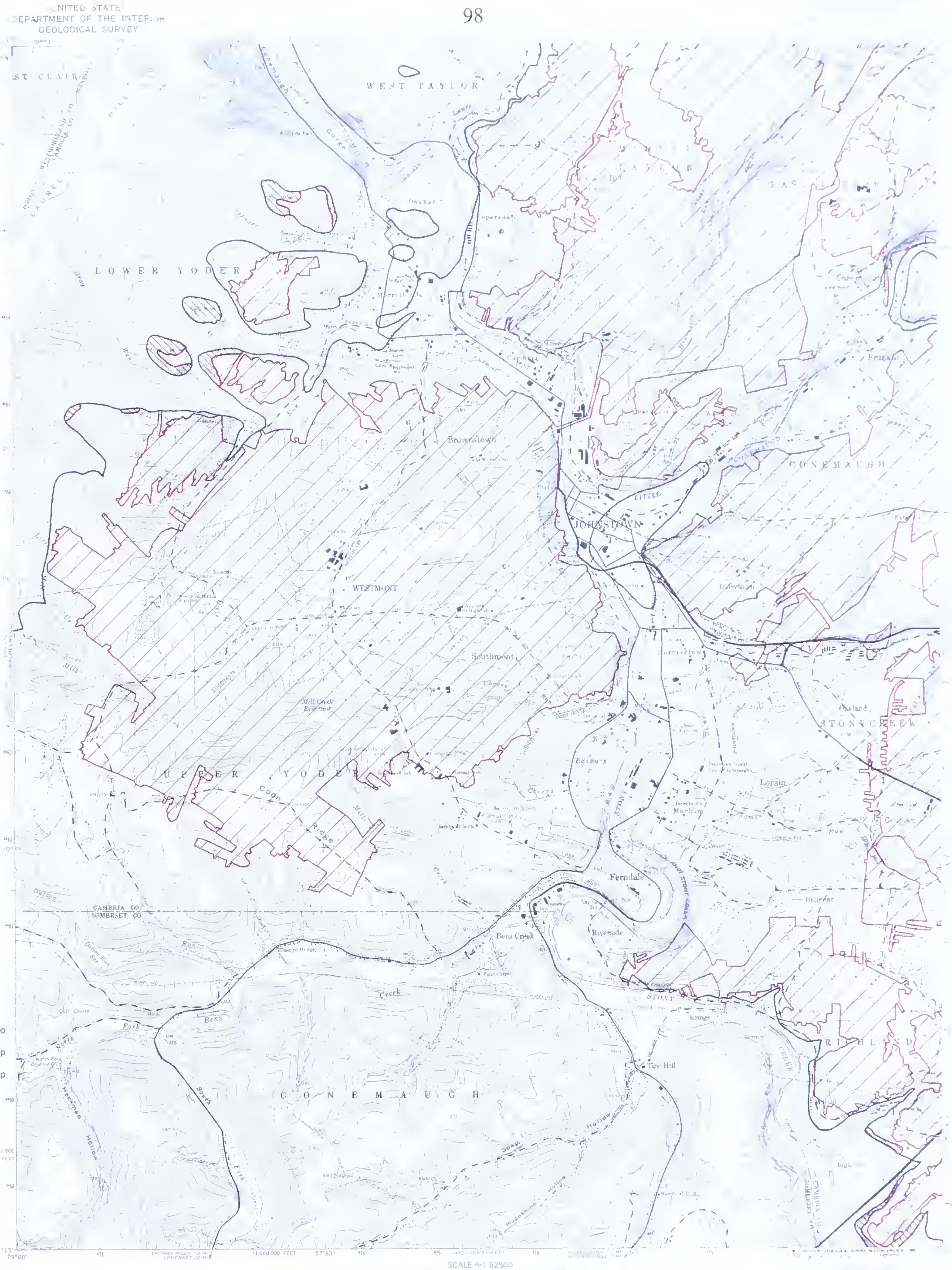
COAL CROP LINES AND STRUCTURE CONTOURS

EXPLANATION

Crop line of the Lower Kittanning coal

▧ Extent of known strip mining

▨ Extent of known deep mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1964 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

JOHNSTOWN

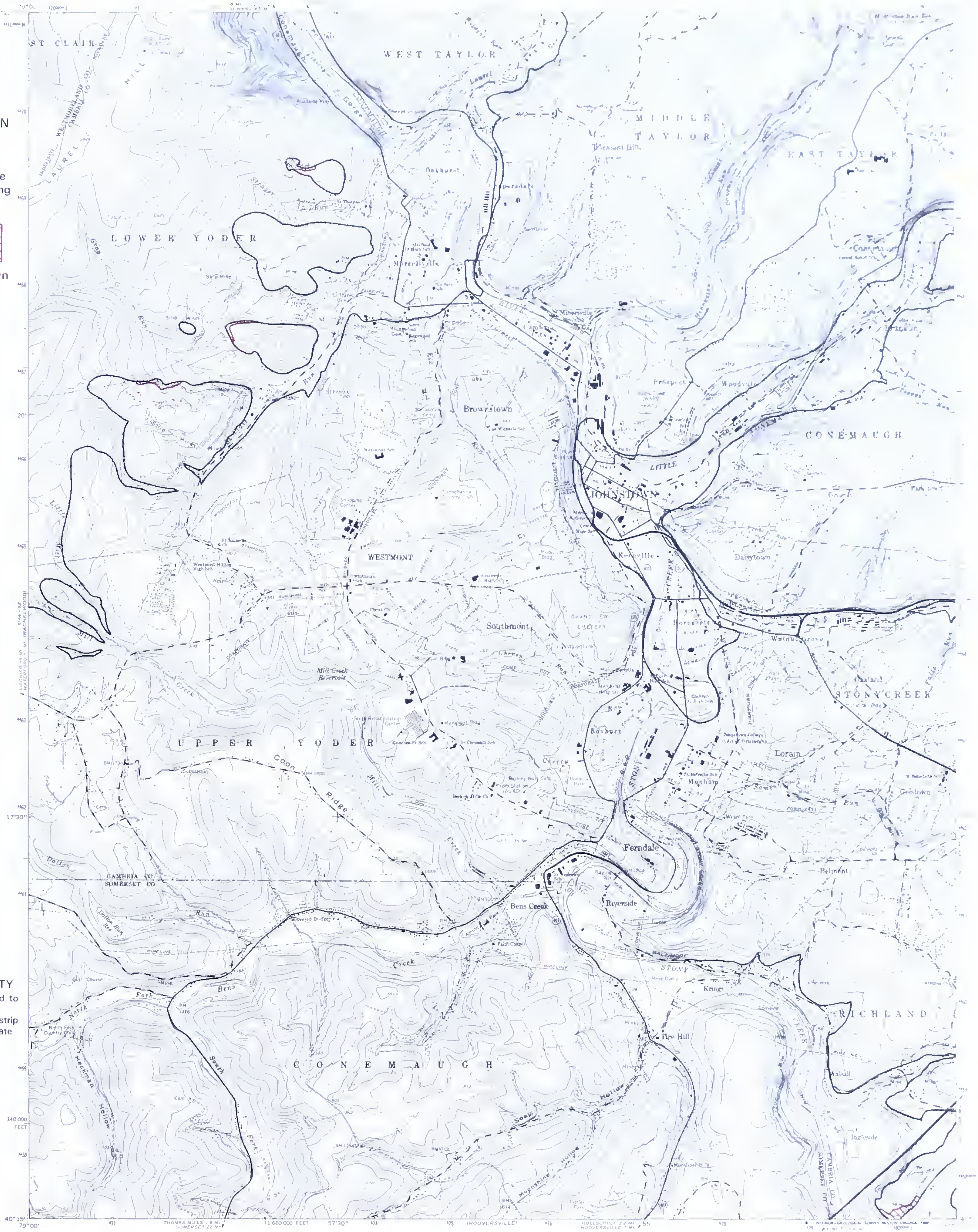
CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

JOHNSTOWN

CROP LINE AND MINED-OUT AREAS OF THE MIDDLE KITTANNING COAL

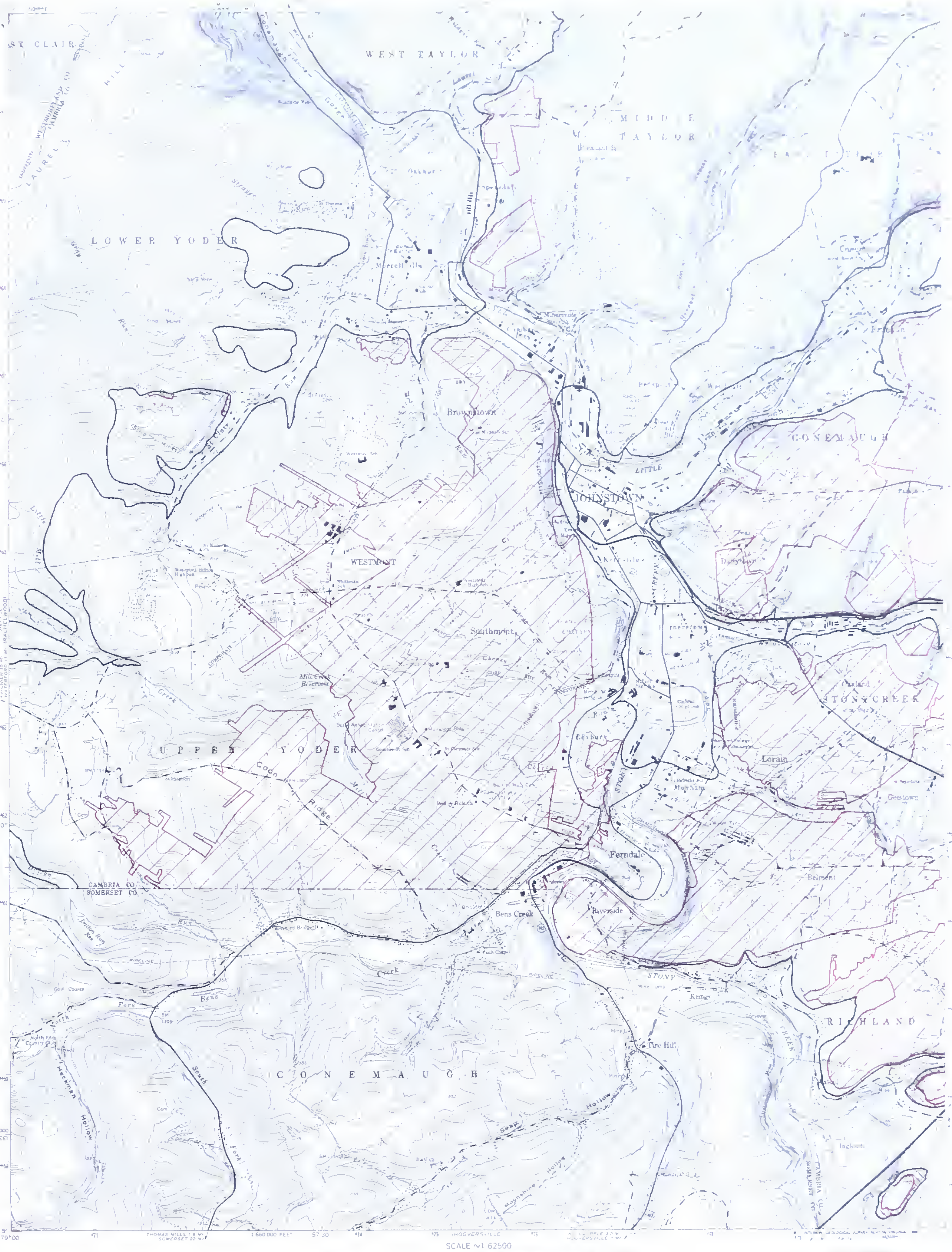
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

JOHNSTOWN

CROP LINE AND MINED-OUT AREAS OF THE

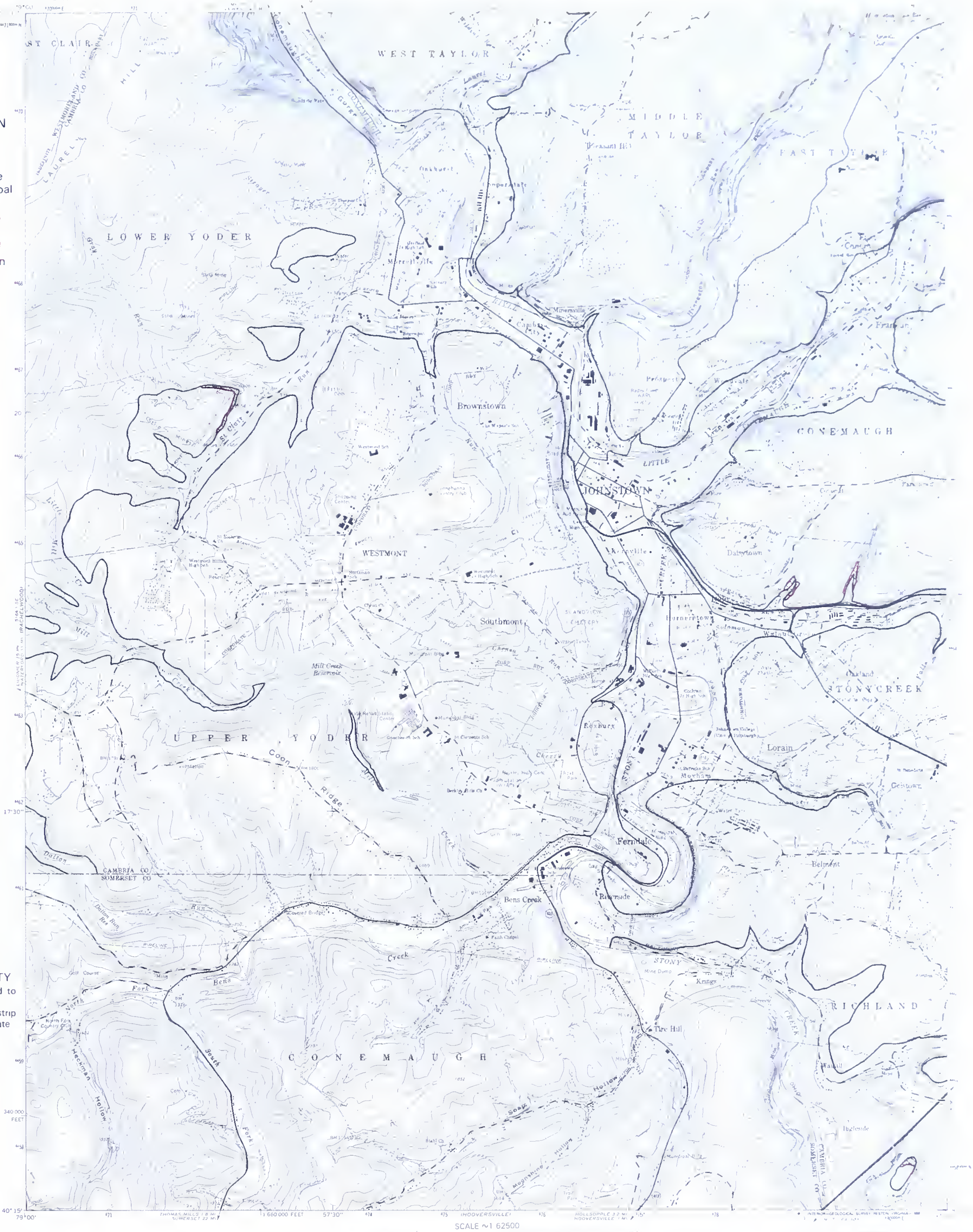
UPPER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Freeport coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

JOHNSTOWN

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

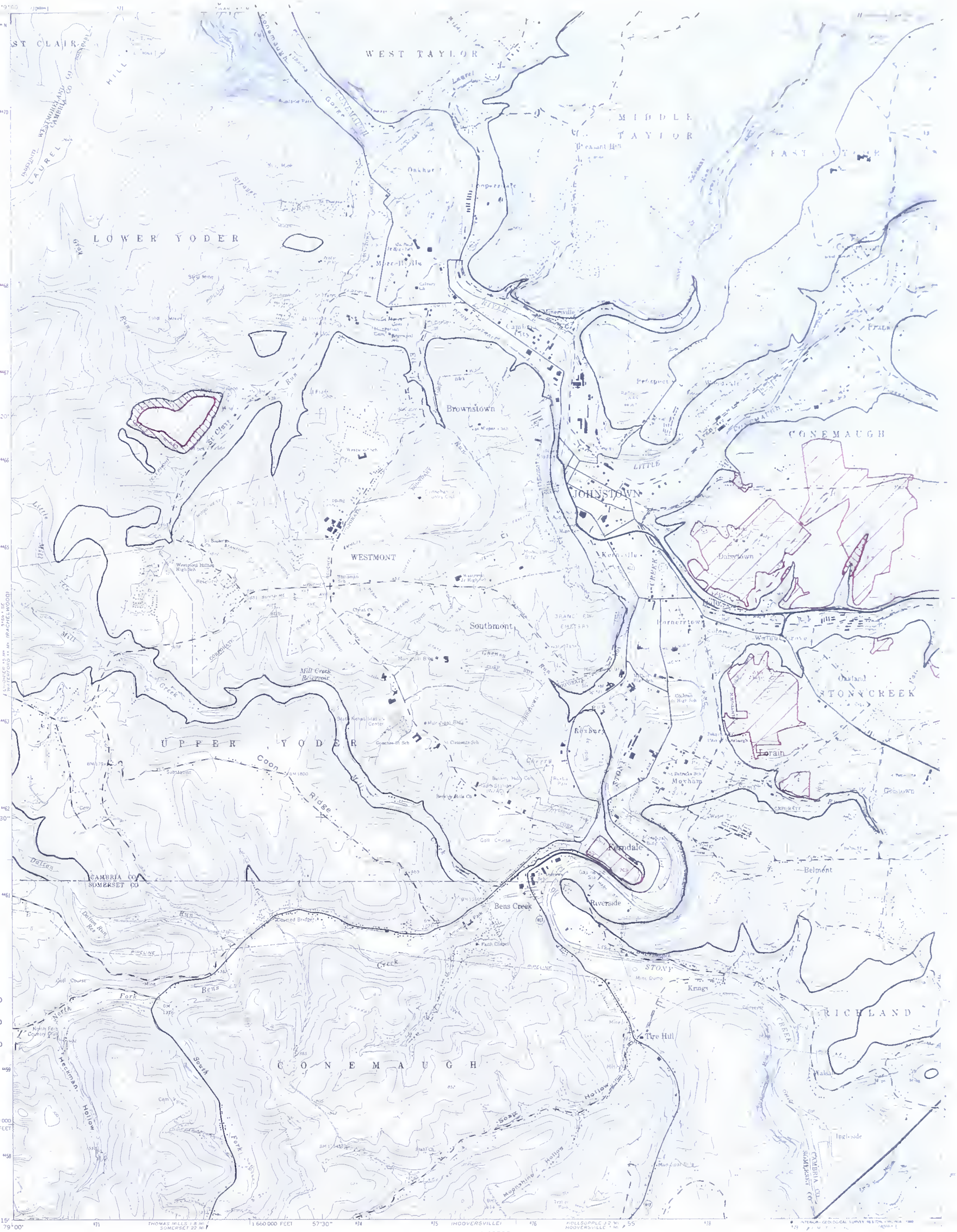
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Upper Freeport coal

▧ Extent of known strip mining

▨ Extent of known deep mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

JOHNSTOWN

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

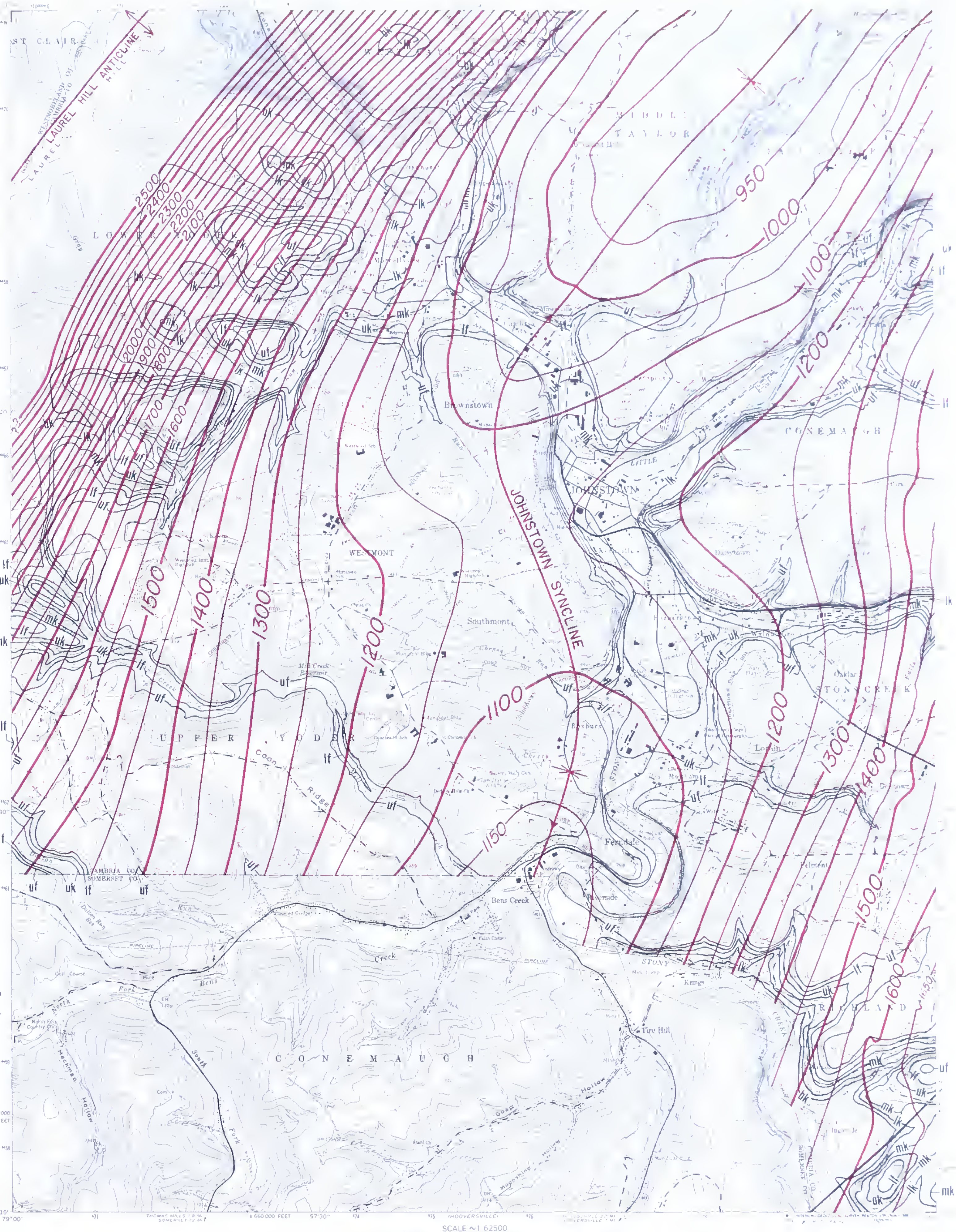
—lk— Lower Kittanning coal

—bk— Brookville coal

Anticline
Showing axial-plane trace.

Syncline
Showing axial-plane trace and direction of plunge.

—1100— Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.



MAP RELIABILITY

Coal crop lines--fair to very good

Structure contours--fair to very good

SOURCES

Crop line of the Middle Kittanning coal by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, and locations of strip mines on topographic map.

Other crop lines and structure contours modified by A. D. Glover from Phalen (1910) using unpublished data and/or locations of strip mines on topographic map.

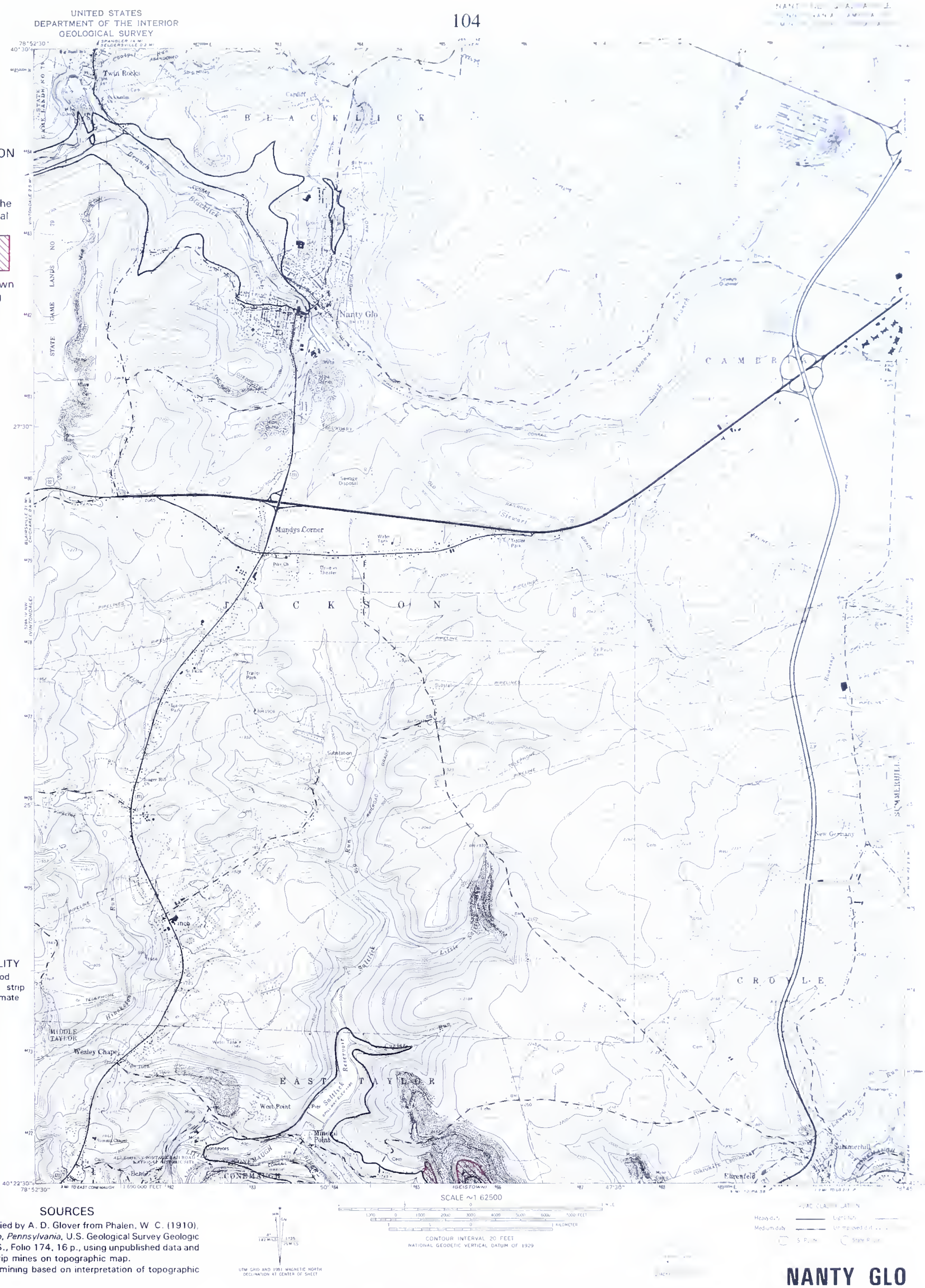
JOHNSTOWN

COAL CROP LINES AND STRUCTURE CONTOURS

EXPLANATION

〰 Crop line of the Brookville coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good

Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

NANTY GLO

CROP LINE AND MINED-OUT AREAS OF THE
BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

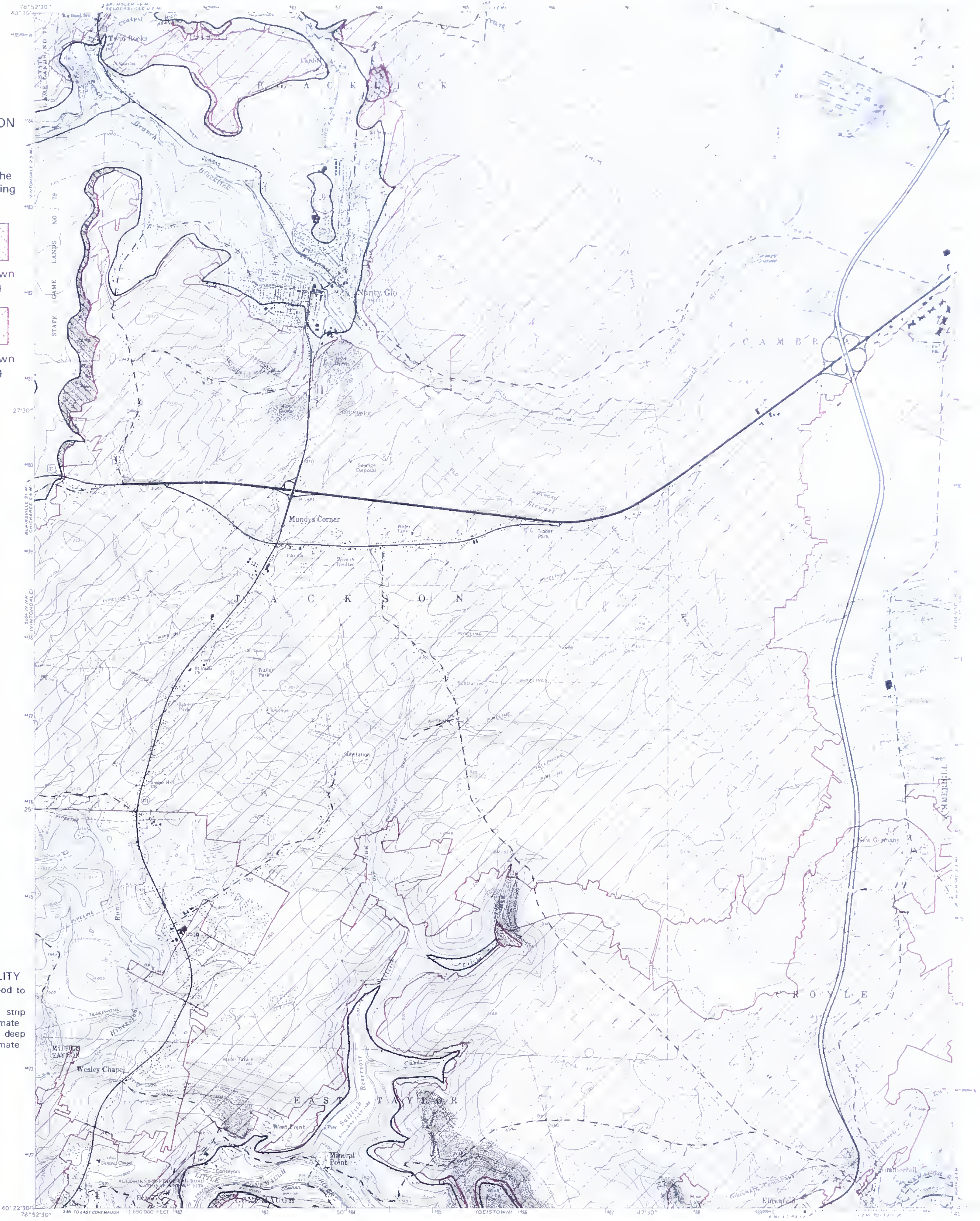
▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

Limits of known deep mining--approximate



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

NANTY GLO

CROP LINE AND MINED-OUT AREAS OF THE

LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

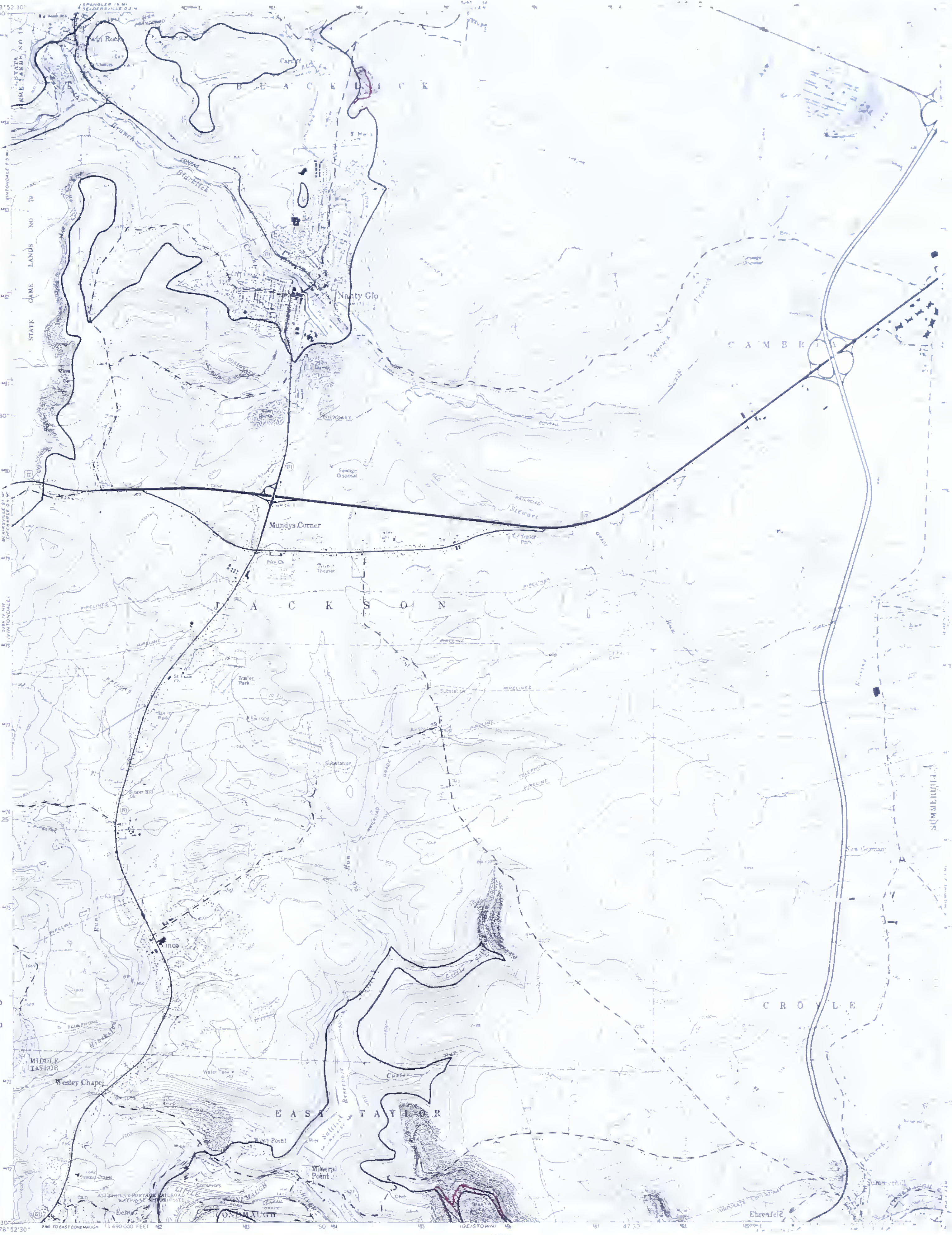
EXPLANATION

Crop line of the Middle Kittanning coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate



SCALE ~1 62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

SOURCES

Crop line by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

NANTY GLO

CROP LINE AND MINED-OUT AREAS OF THE
MIDDLE KITTANNING COAL

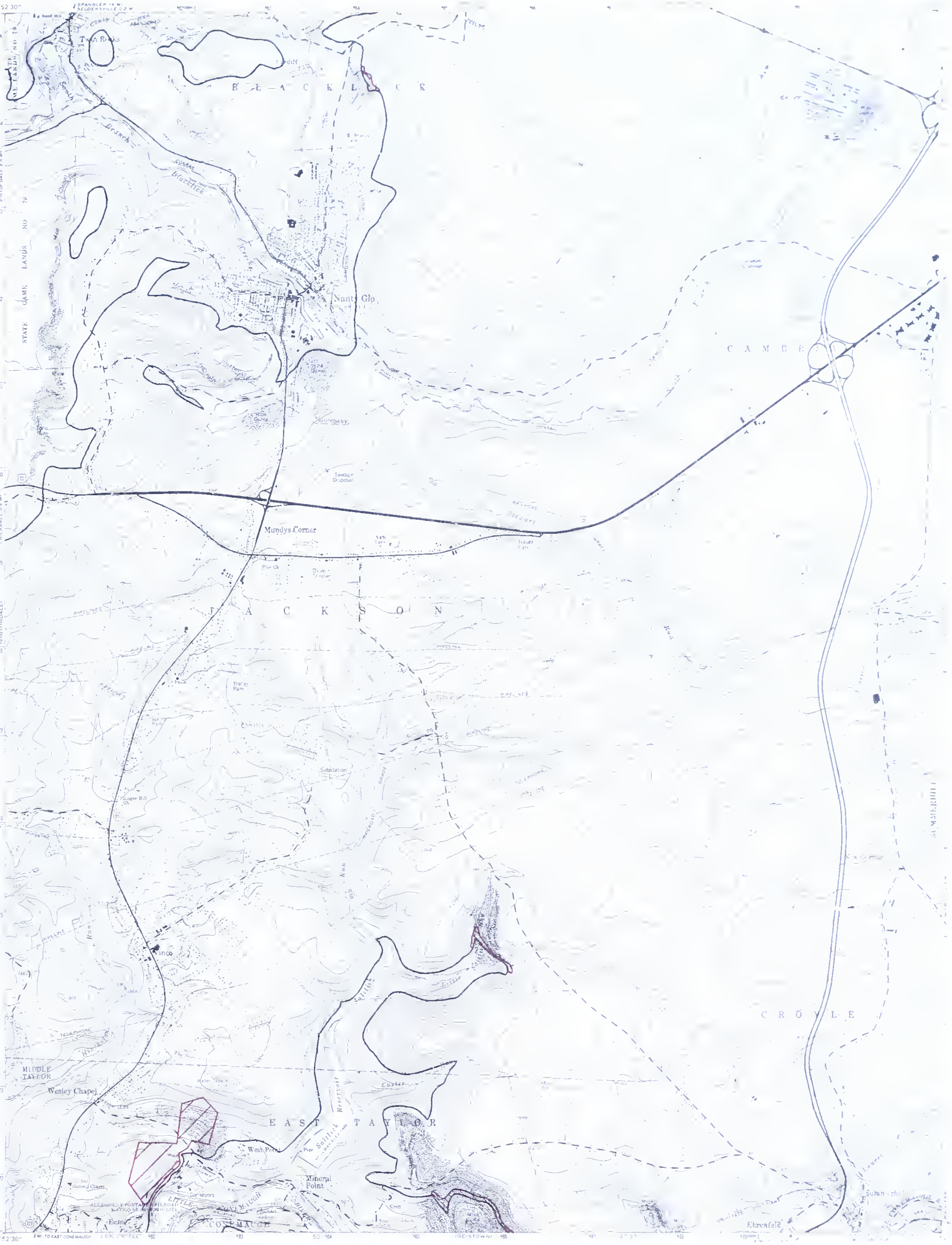
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

～ Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

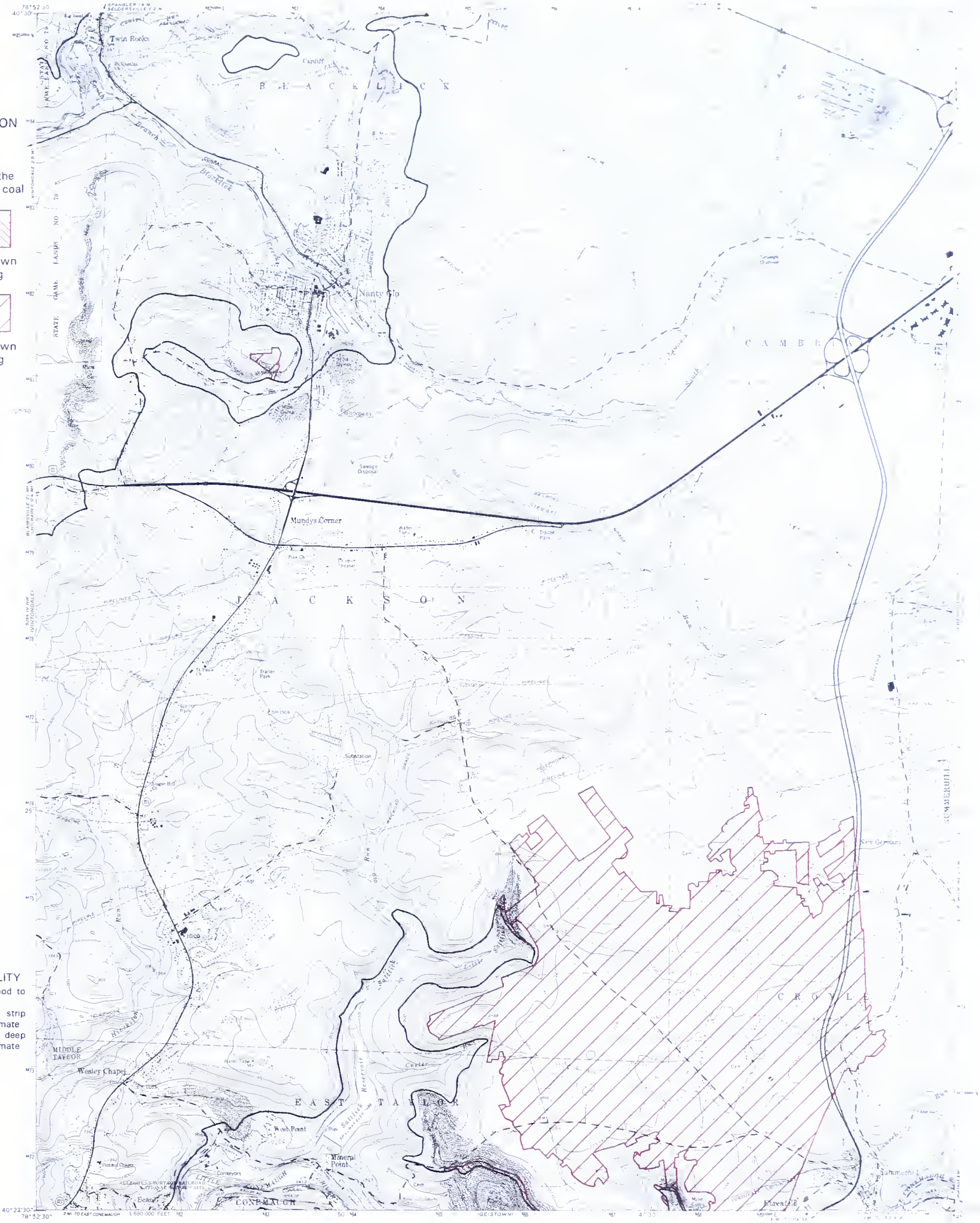
Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

NANTY GLO

CROP LINE AND MINED-OUT AREAS OF THE UPPER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

- Crop line of the Lower Freeport coal
- ▨ Extent of known strip mining
- ▨ Extent of known deep mining

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

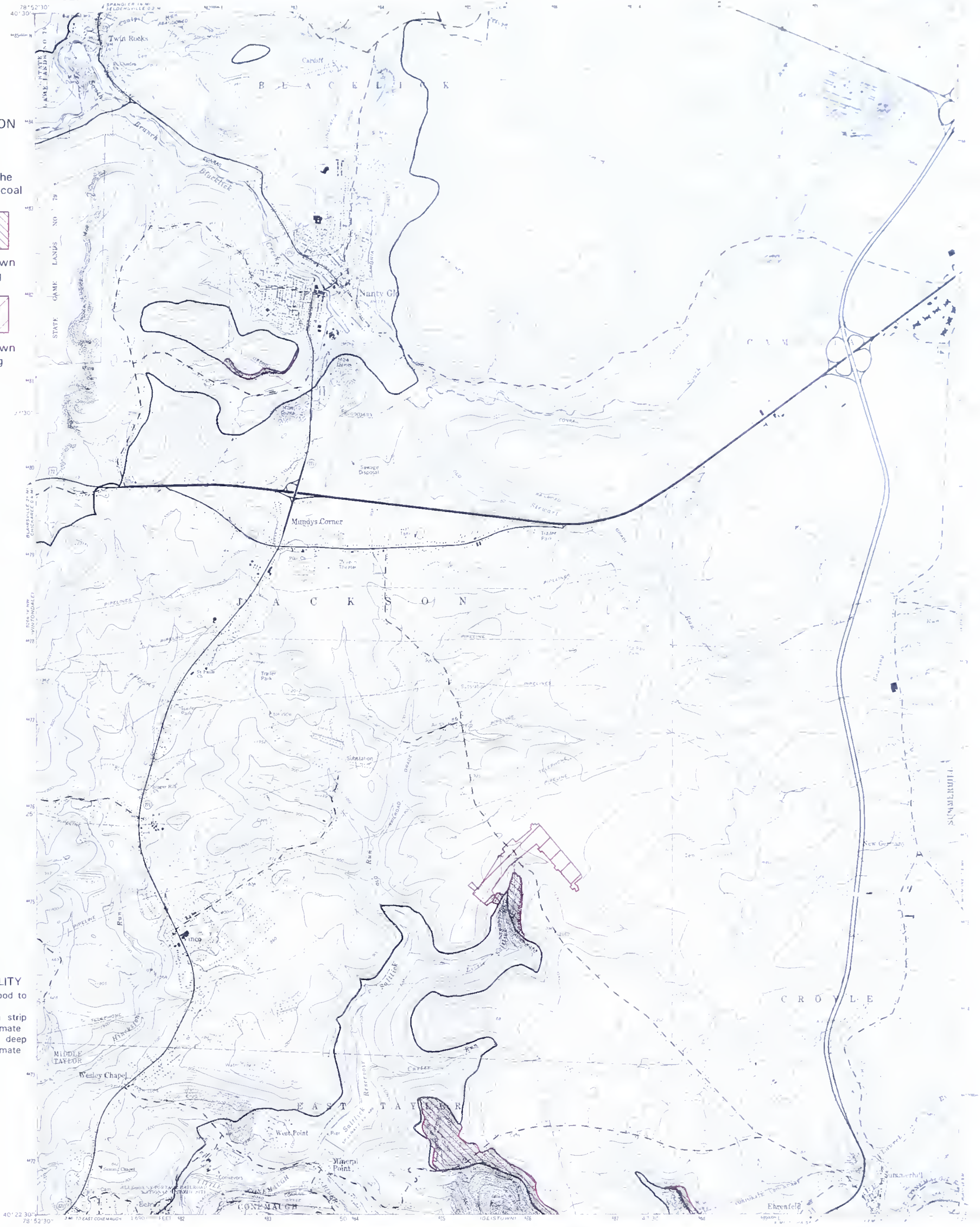
NANTY GLO

CROP LINE AND MINED-OUT AREAS OF THE
LOWER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

⌒	Crop line of the Upper Freeport coal
▧	Extent of known strip mining
▨	Extent of known deep mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

NANTY GLO

CROP LINE AND MINED-OUT AREAS OF THE
UPPER FREEPORT COAL

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—bk— Brookville coal

—mr— Mercer coal

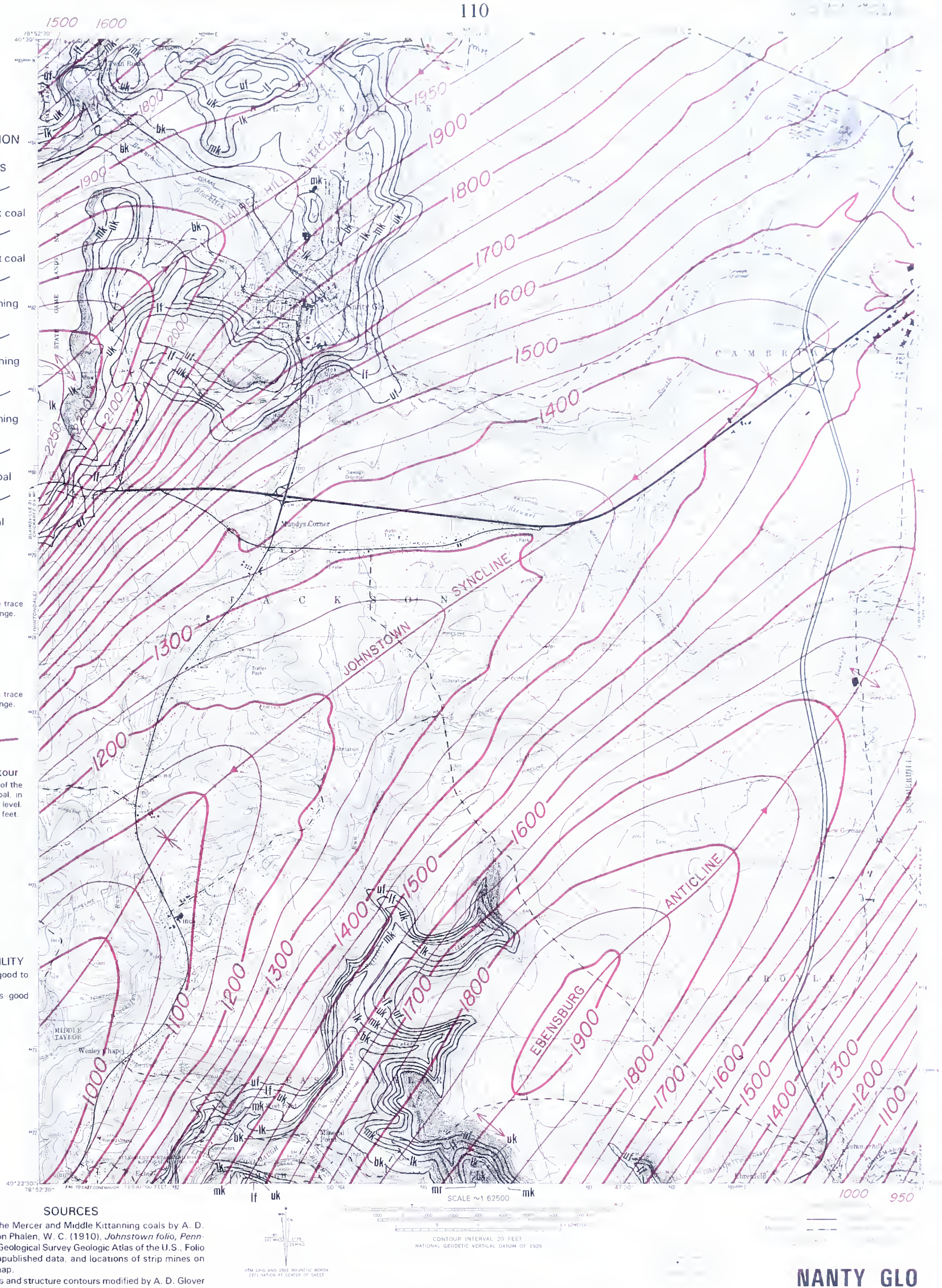
Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

—1500—
Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good



SOURCES

Crop lines of the Mercer and Middle Kittanning coals by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, and locations of strip mines on topographic map.
Other crop lines and structure contours modified by A. D. Glover from Phalen (1910) using unpublished data and/or locations of strip mines on topographic map.

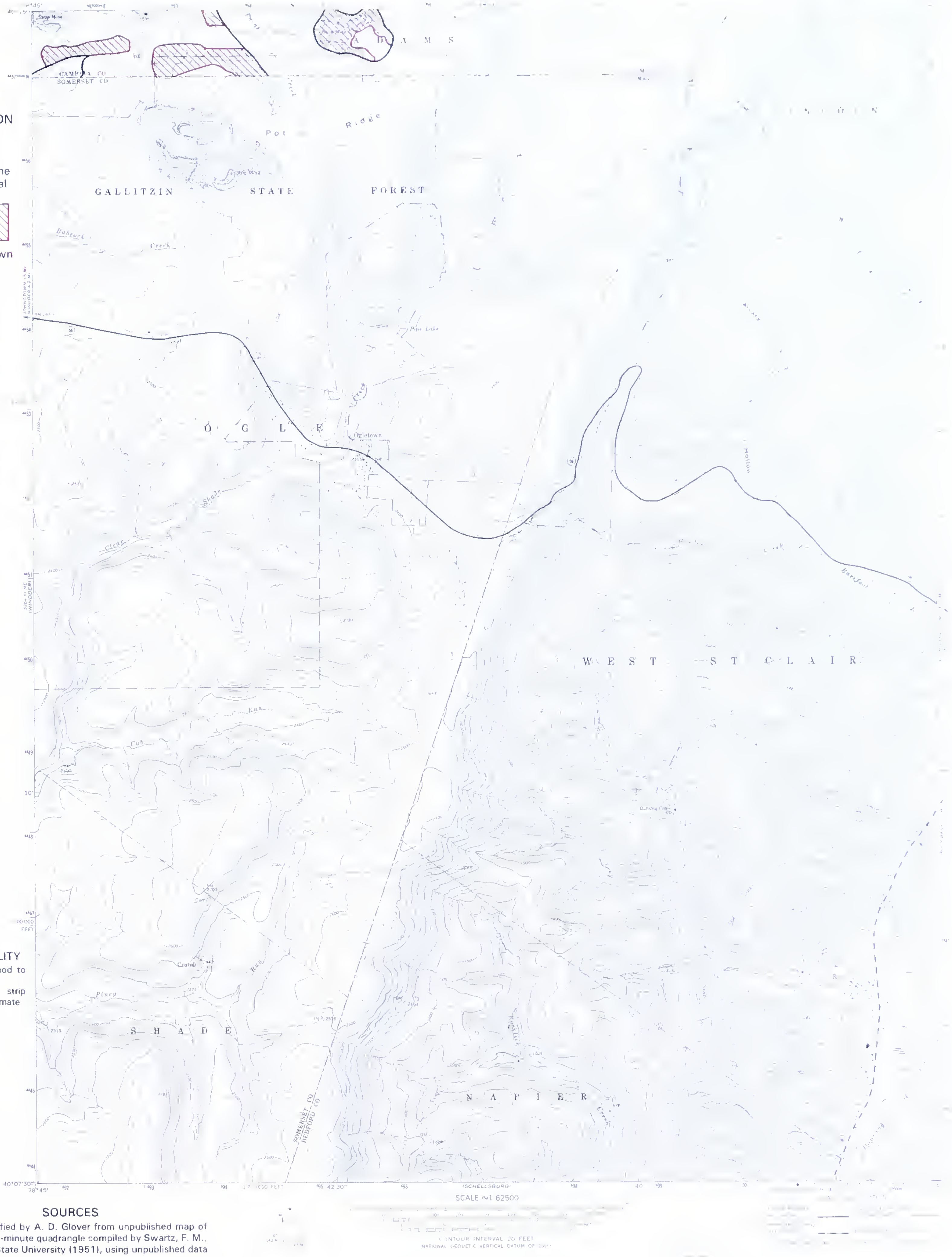
NANTY GLO

COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

—	Crop line of the Brookville coal
▨	Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from unpublished map of the Bedford 15-minute quadrangle compiled by Swartz, F. M., Pennsylvania State University (1951), using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

OGLETOWN

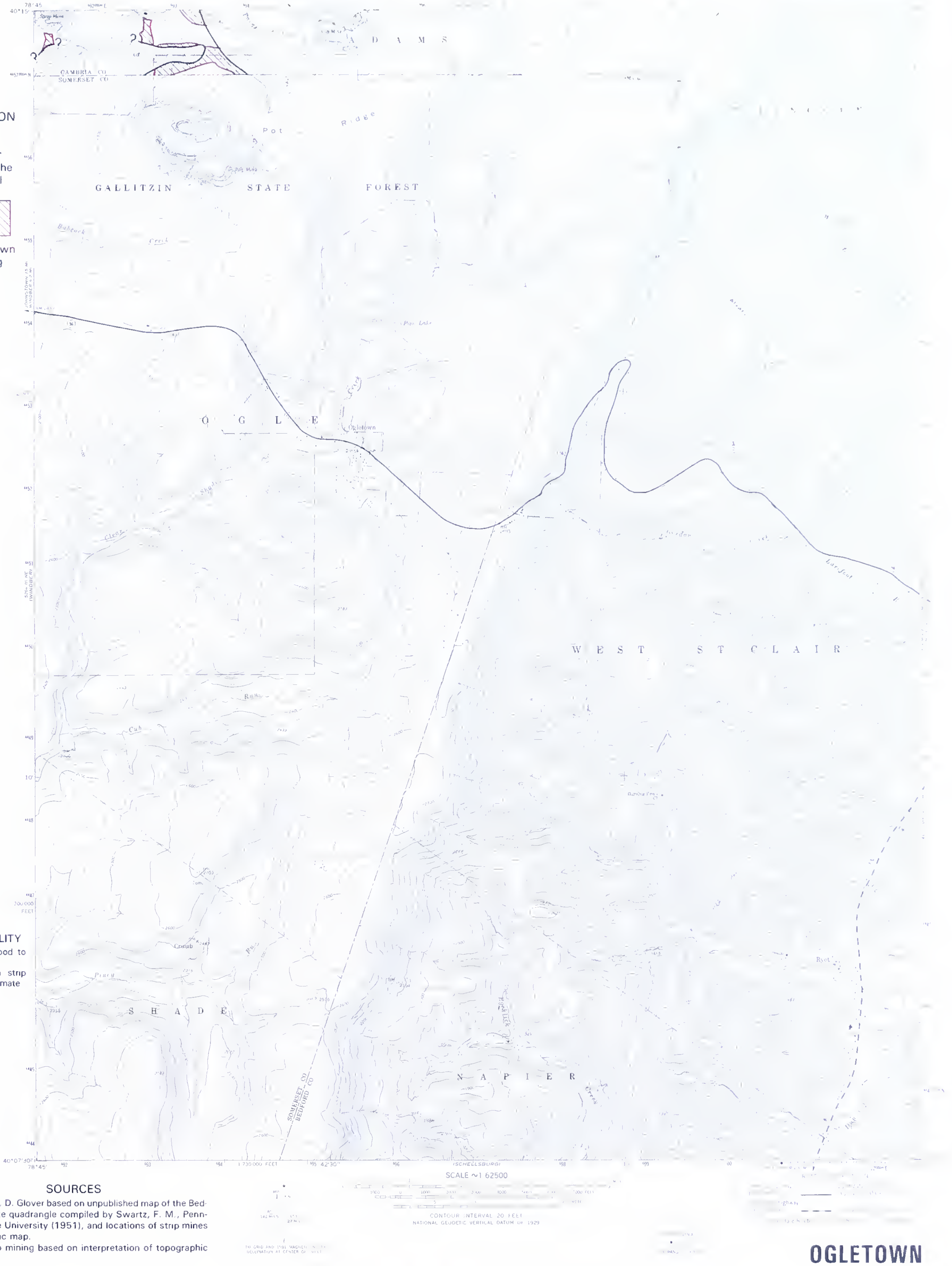
CROP LINE AND MINED-OUT AREAS OF THE
BROOKVILLE COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Clarion coal

▨ Extent of known strip mining



MAP RELIABILITY
Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on unpublished map of the Bedford 15-minute quadrangle compiled by Swartz, F. M., Pennsylvania State University (1951), and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

OGLETOWN

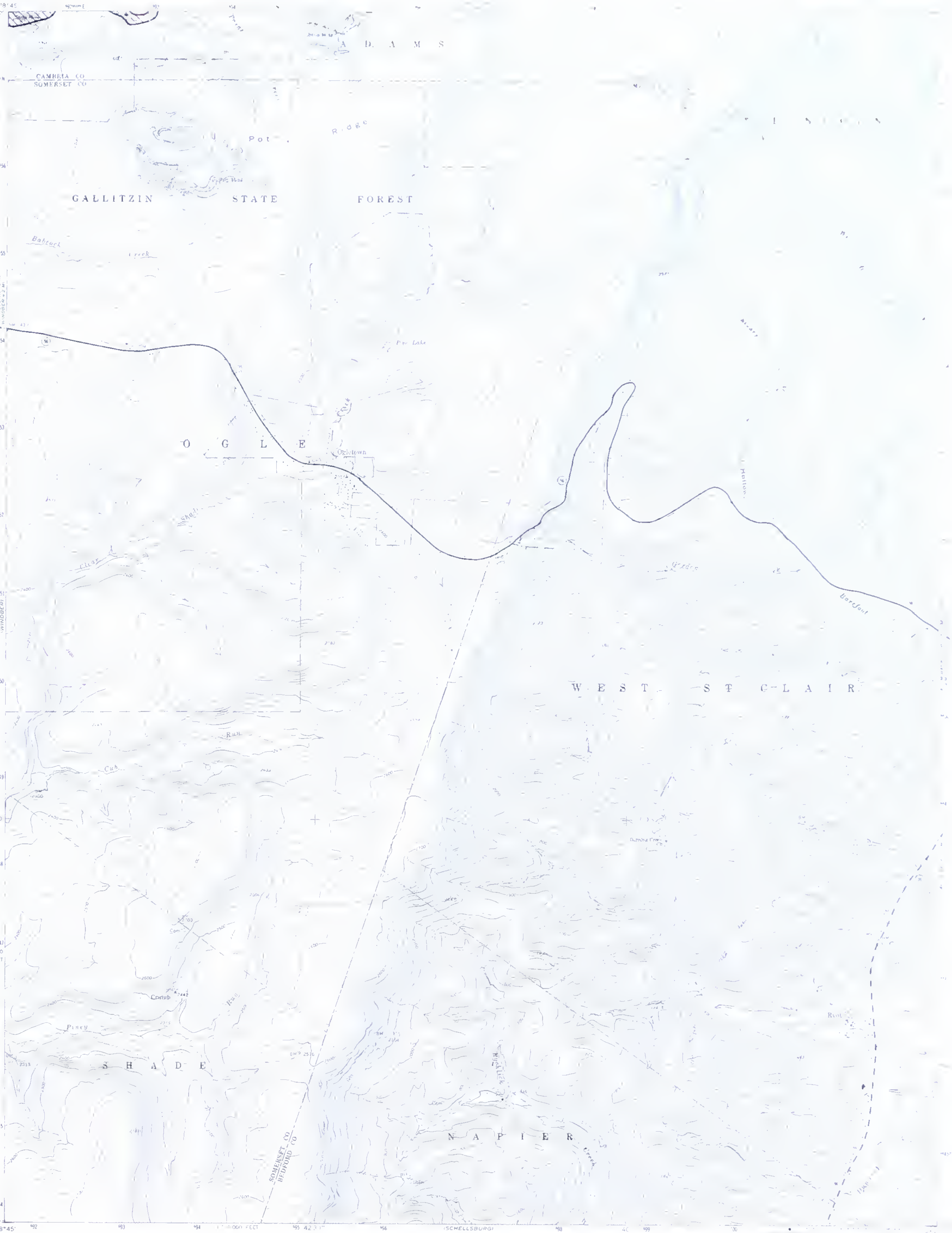
CROP LINE AND MINED-OUT AREAS OF THE
CLARION COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

～ Crop line of the Lower Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from unpublished map of the Bedford 15-minute quadrangle compiled by Swartz, F. M., Pennsylvania State University (1951), using unpublished data and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

OGLETOWN

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

EXPLANATION

CROP LINES

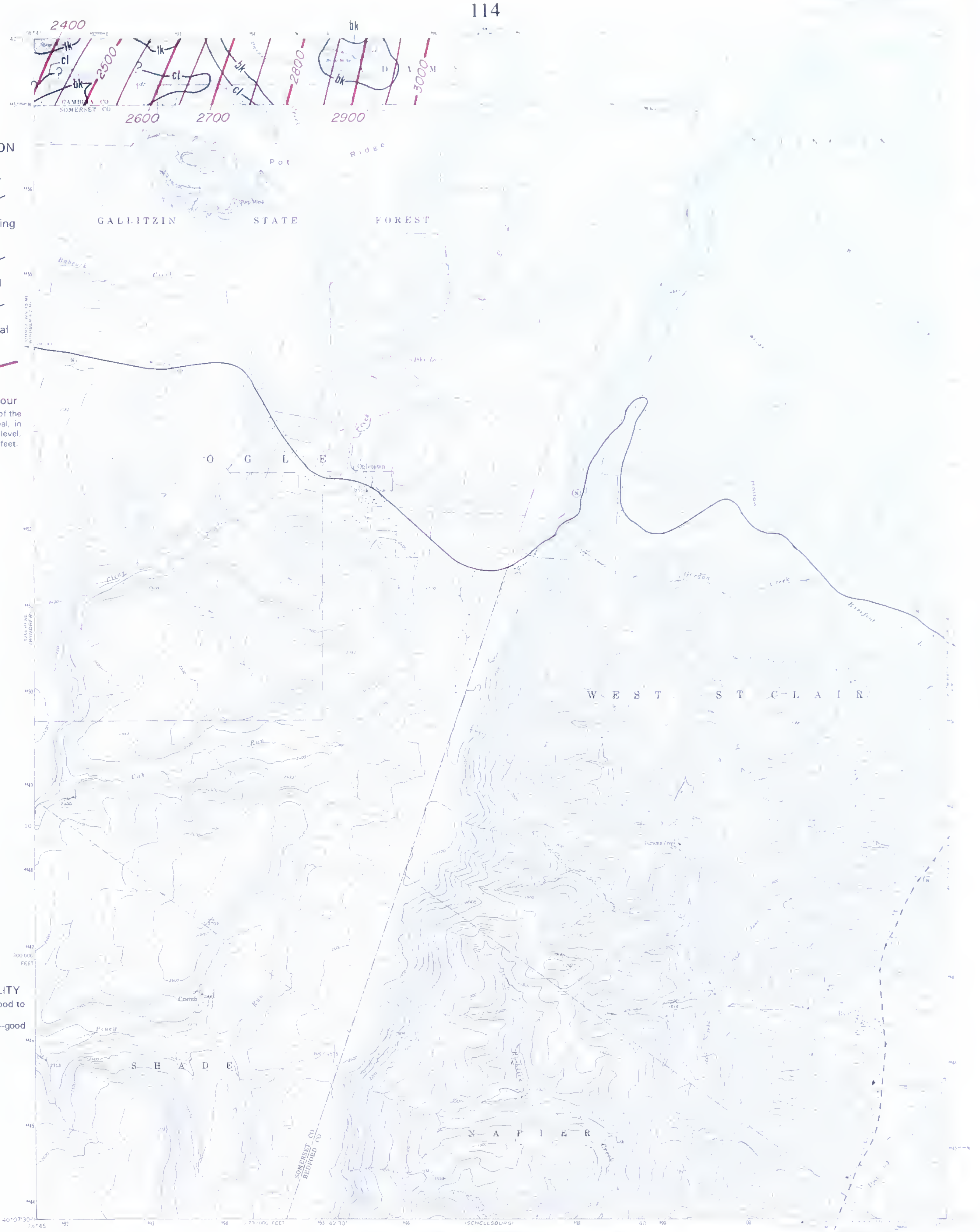
—lk— Lower Kittanning coal

—cl— Clarion coal

—bk— Brookville coal

—2600— Structure contour

Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.



MAP RELIABILITY

Coal crop lines--good to very good

Structure contours--good to very good

SOURCES

Crop line of the Clarion coal by A. D. Glover based on unpublished map of the Bedford 15-minute quadrangle compiled by Swartz, F. M., Pennsylvania State University (1951), and locations of strip mines on topographic map.

Other crop lines modified by A. D. Glover from Swartz (1951) using unpublished data and locations of strip mines on topographic map.

Structure contours by A. D. Glover based on crop of Lower Kittanning coal.

OGLETOWN

COAL CROP LINES AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

uf — Upper Freeport coal

lf — Lower Freeport coal

uk — Upper Kittanning coal

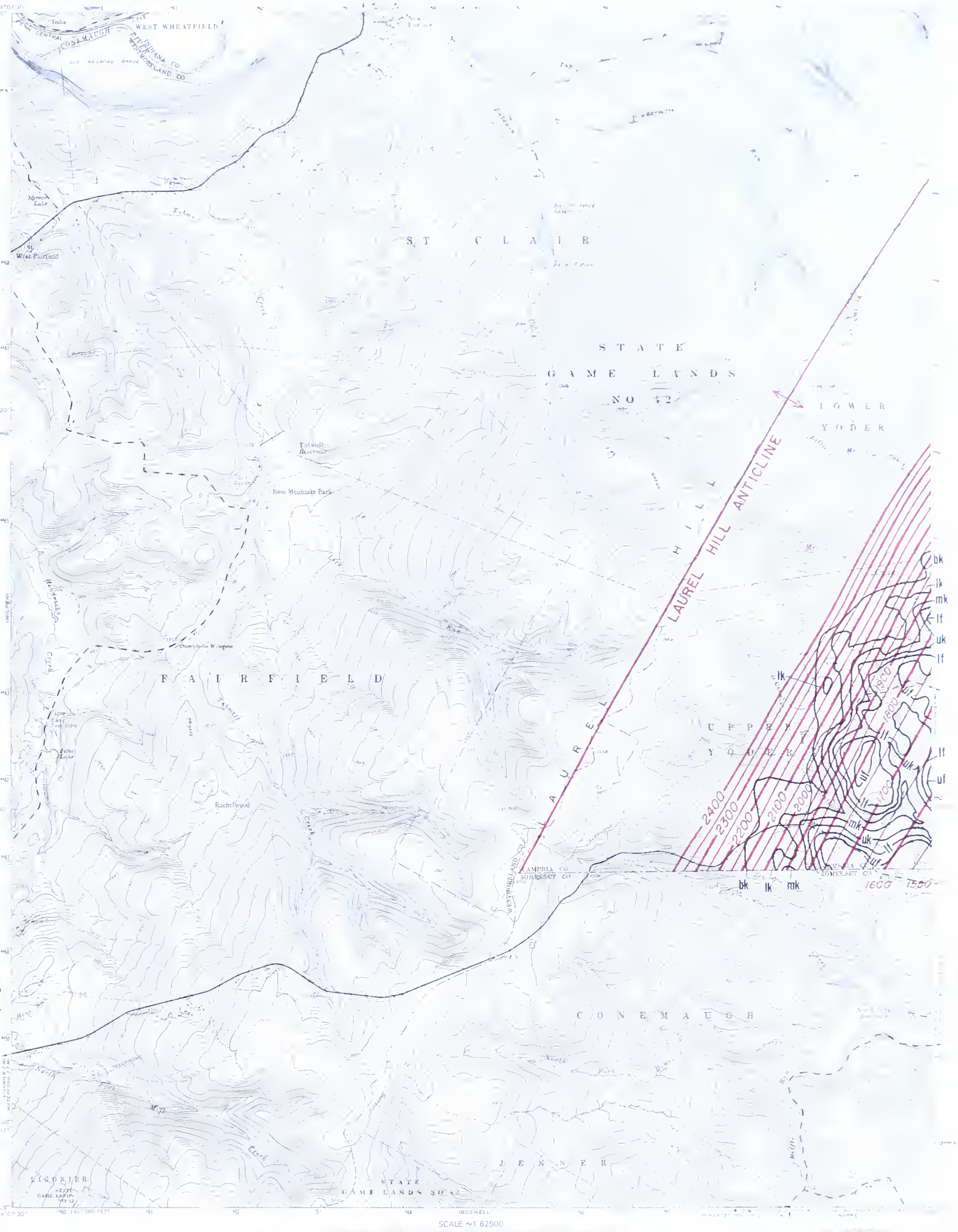
mk — Middle Kittanning coal

lk — Lower Kittanning coal

bk — Brookville coal

Anticline
Showing axial-plane trace.

2400 — Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.



MAP RELIABILITY

Coal crop lines--fair to good
Structure contours--fair to good

SOURCES

Crop lines and structure contours modified by A. D. Glover from Shaffner, M. N. (1958), *Geology and mineral resources of the New Florence quadrangle, Pennsylvania*, Pennsylvania Geological Survey, 4th ser., Atlas 57, 165 p., using unpublished data.

RACHELWOOD

COAL CROP LINES AND STRUCTURE CONTOURS

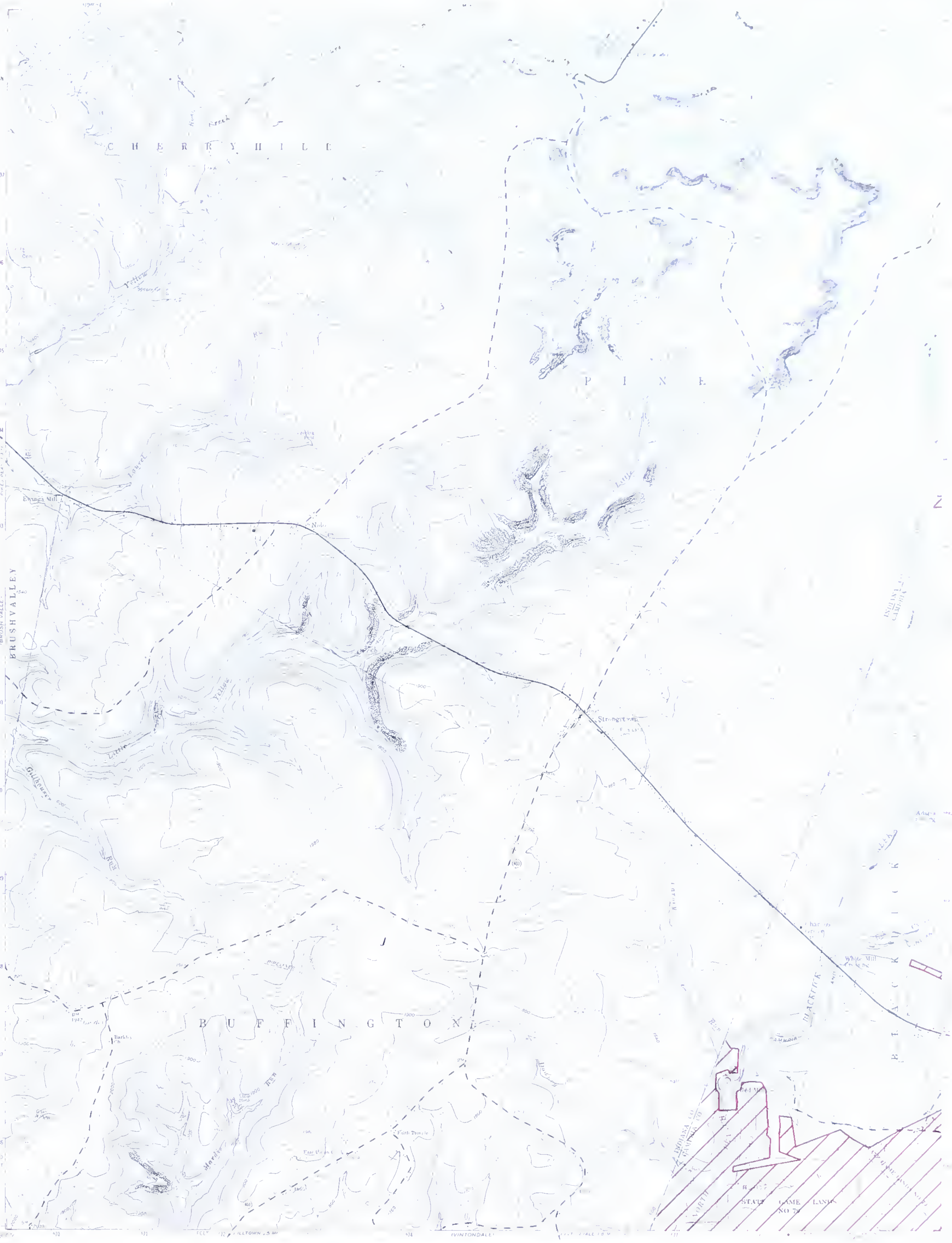
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

▨ Extent of known deep mining

MAP RELIABILITY

Limits of known deep mining--approximate



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

SOURCE

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

STRONGSTOWN

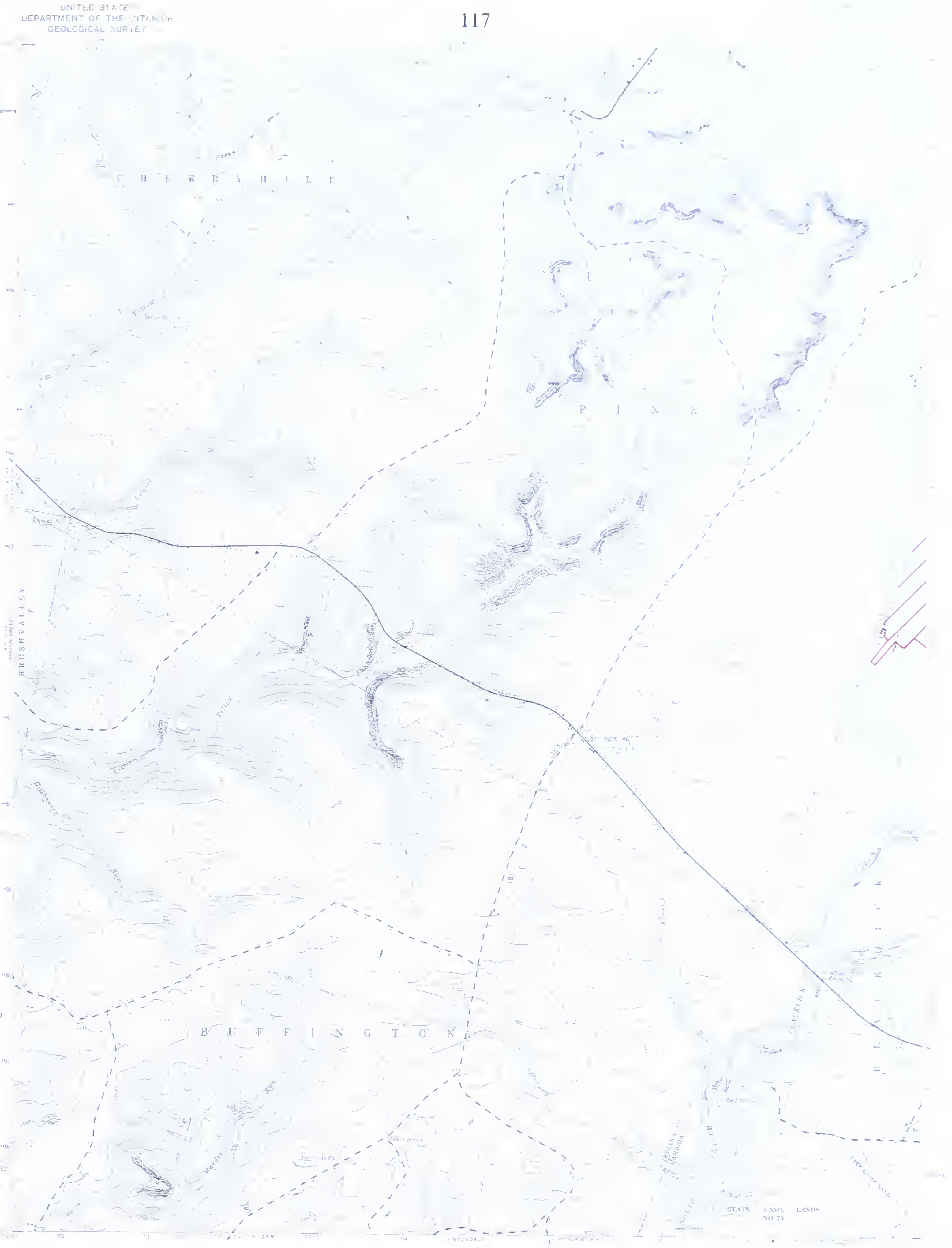
MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

EXPLANATION

▨ Extent of known deep mining

MAP RELIABILITY

- - - Limits of known deep mining--approximate



SOURCE

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

STRONGSTOWN

MINED-OUT AREA OF THE
LOWER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINE

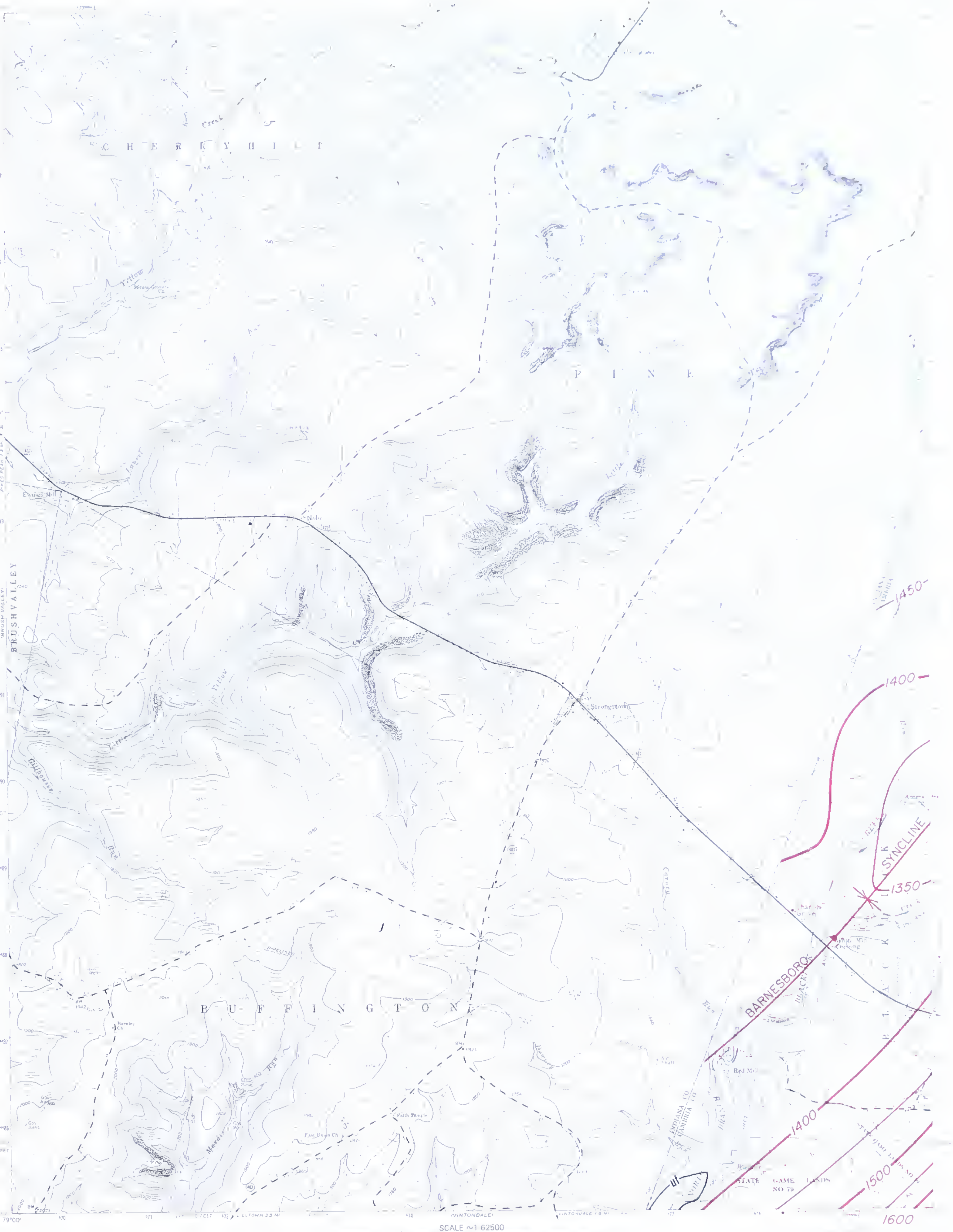
—uf—

Upper Freeport coal

Syncline
Showing axial-plane trace and direction of plunge.

—1500—

Structure contour
Altitude of the base of the Lower Freeport coal, in feet above mean sea level. Contour interval 50 feet.



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

MAP RELIABILITY

Coal crop line--good to very good
Structure contours--good to very good

SOURCES

Crop line modified by A. D. Glover from Campbell, M. R., Clapp, F. G., and Butts, Charles (1913), *Barnesboro-Patton folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 189, 13 p., using unpublished data.

Structure contours modified by A. D. Glover from Campbell and others (1913) using trend of structure contours in adjacent area (unpublished map of Strongstown 7.5-minute quadrangle, Indiana County, by Bragonier, W. A., Rochester and Pittsburgh Coal Company [1986]) and unpublished data.

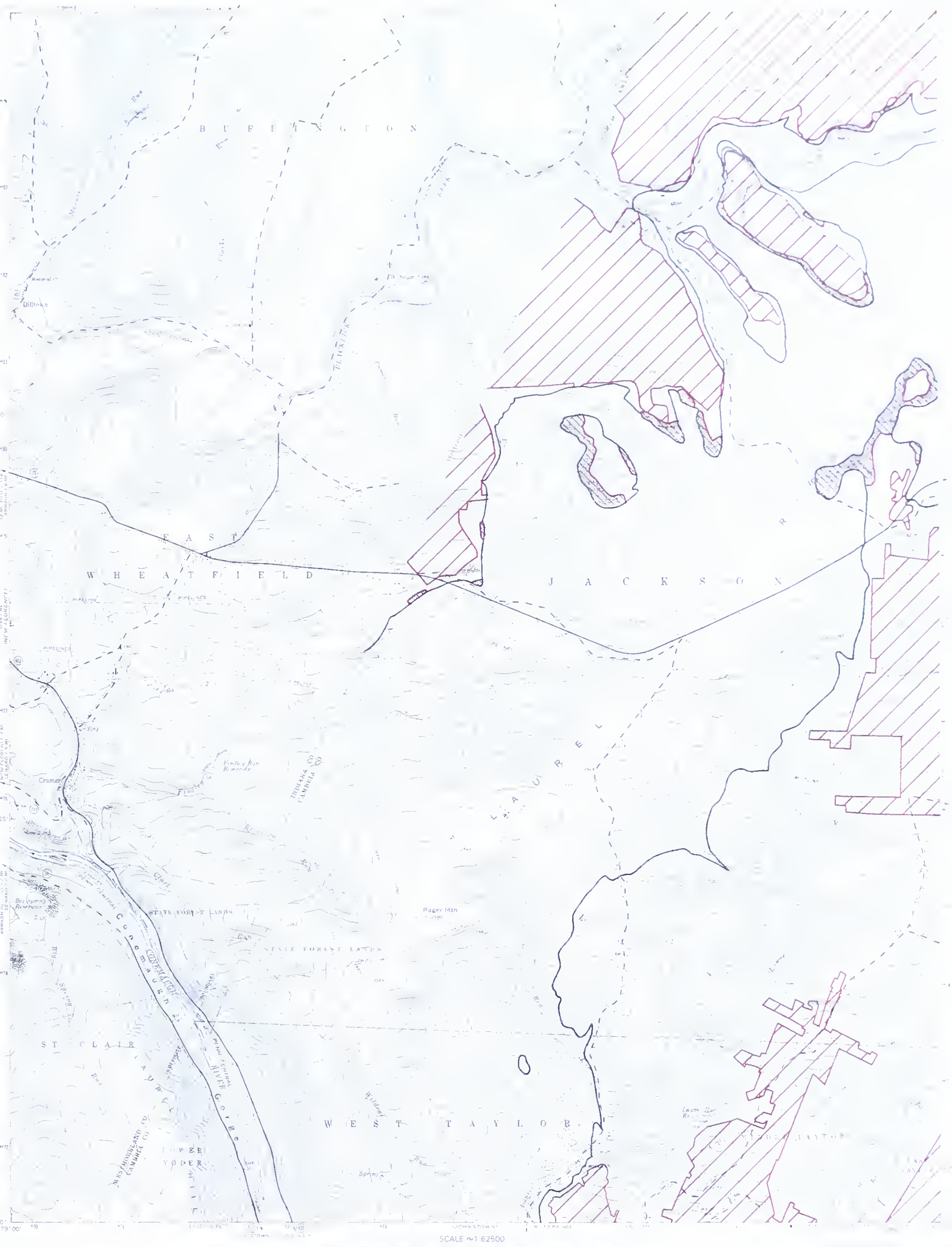
STRONGSTOWN

COAL CROP LINE AND STRUCTURE CONTOURS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

- — Crop line of the Lower Kittanning coal
- ▨ Extent of known strip mining
- ▨ Extent of known deep mining



MAP RELIABILITY

Coal crop line--poor to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data, locations of strip mines on topographic map, and crop line extended from adjacent area (unpublished map of Vintondale 7.5-minute quadrangle, Indiana County, by Bragonier, W. A., Rochester and Pittsburgh Coal Company [1986]).

Limits of strip mining based on interpretation of topographic map.

Limits of deep mining from unpublished mine map provided by M. D. Sincak, Cambria County Mineral Assessment Office.

CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

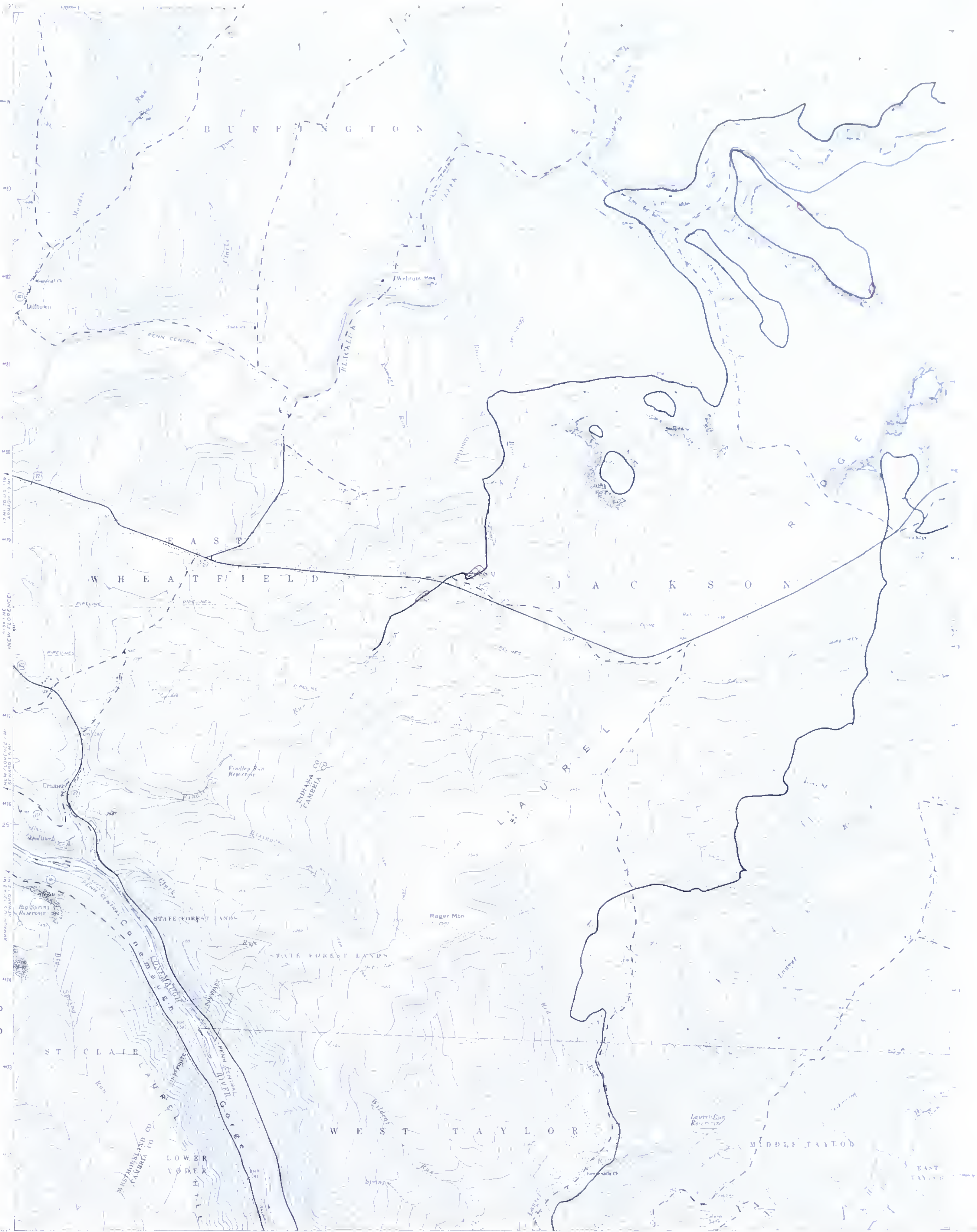
VINTONDALE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--poor to very good
Limits of known strip mining--approximate

SCALE ~1 62500

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

SOURCES

Crop line by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, locations of strip mines on topographic map, and crop line extended from adjacent area (unpublished map of Vintondale 7.5-minute quadrangle, Indiana County, by Bragonier, W. A., Rochester and Pittsburgh Coal Company [1986]).
Limits of strip mining based on interpretation of topographic map.

VINTONDALE

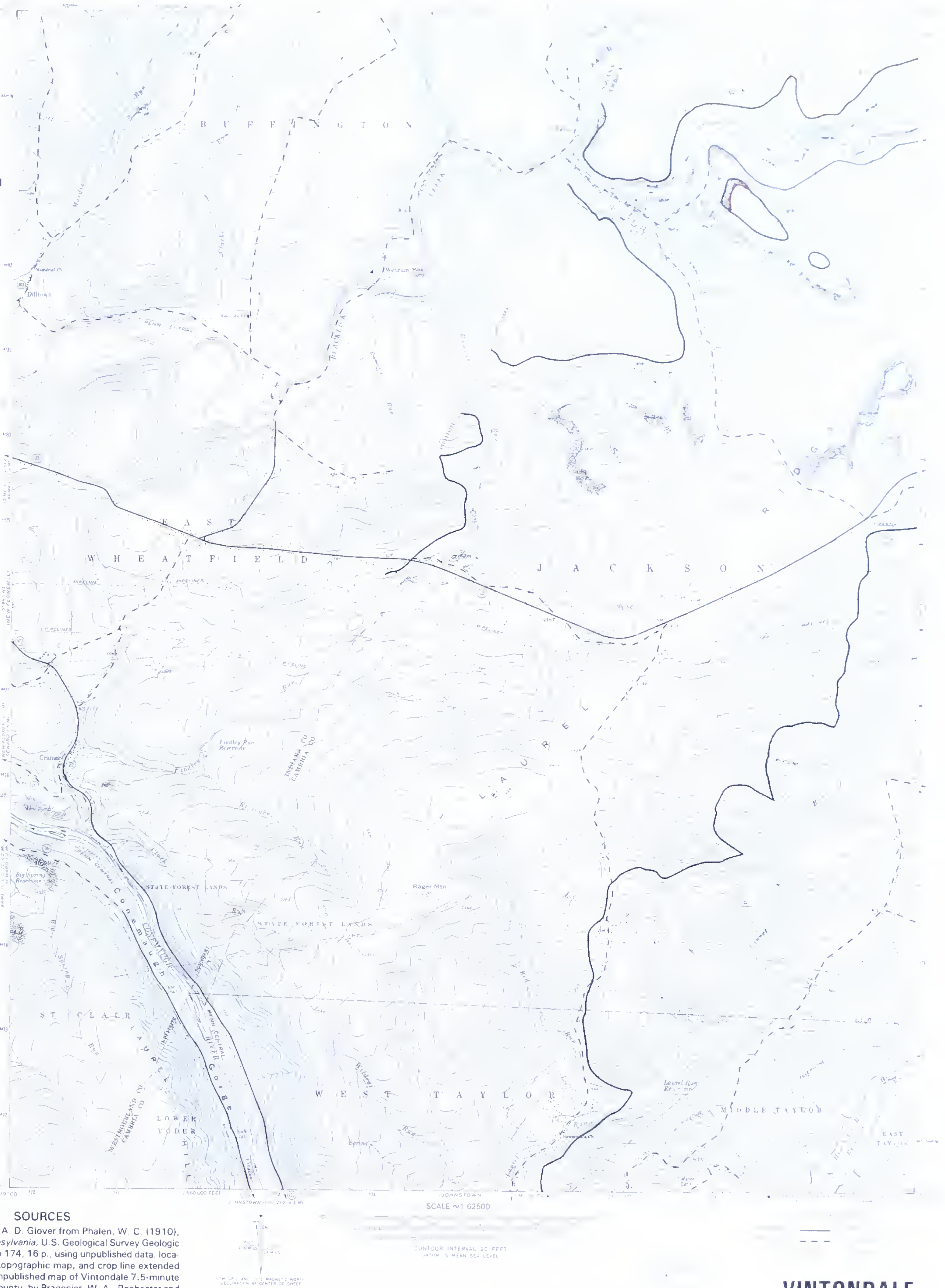
CROP LINE AND MINED-OUT AREAS OF THE
MIDDLE KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Freeport coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--poor to very good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., using unpublished data, location of strip mine on topographic map, and crop line extended from adjacent area (unpublished map of Vintondale 7.5-minute quadrangle, Indiana County, by Bragonier, W. A., Rochester and Pittsburgh Coal Company (1986)).

Limits of strip mining based on interpretation of topographic map.

VINTONDALE

CROP LINE AND MINED-OUT AREA OF THE
LOWER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—bk— Brookville coal

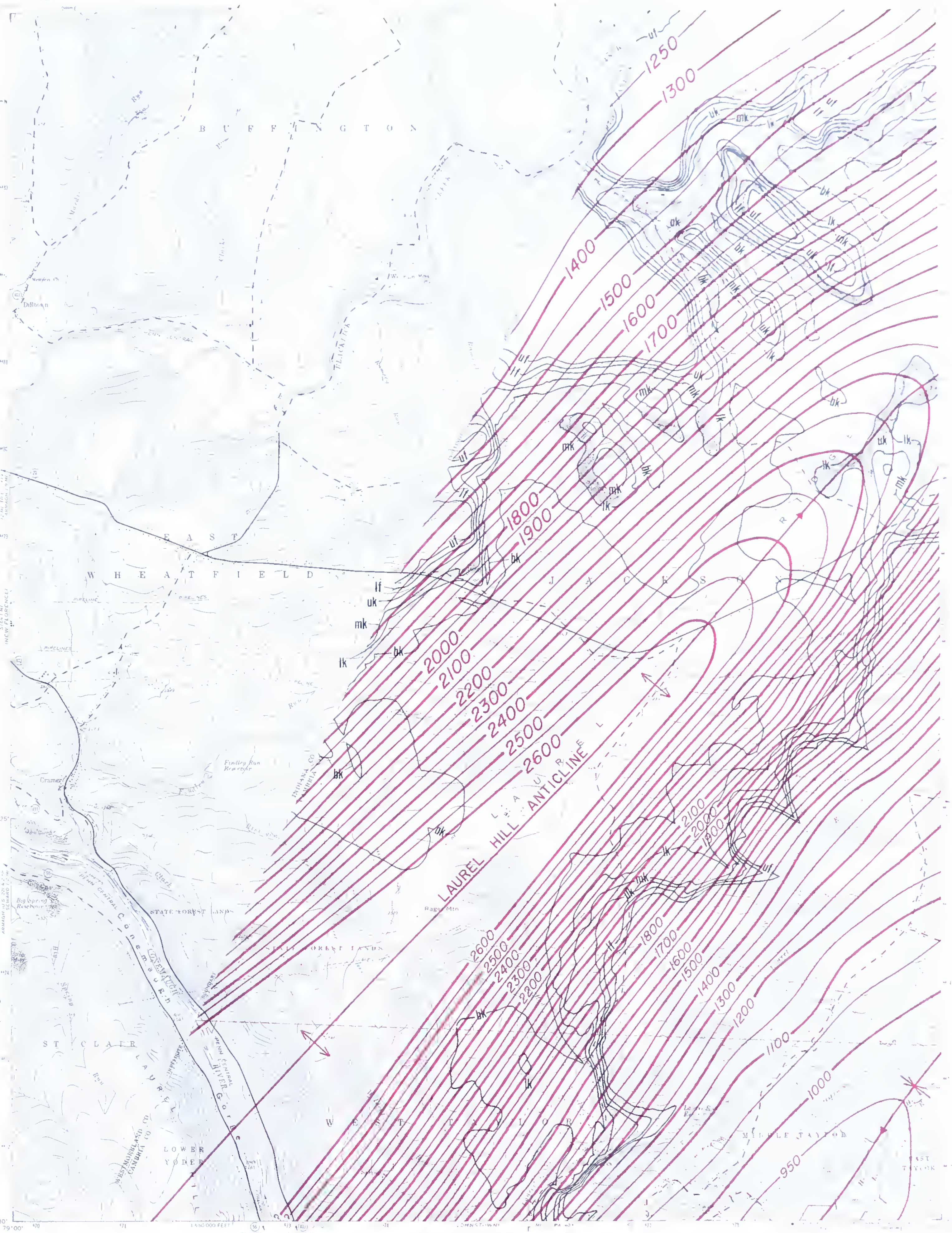
Anticline
Showing axial-plane trace and direction of plunge.

Syncline
Showing axial-plane trace and direction of plunge.

—2000— Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines--poor to very good
Structure contours--poor to very good



SCALE ~1 62500

JOHNSTOWN SYNCLINE

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

SOURCES

Crop line of the Middle Kittanning coal by A. D. Glover based on Phalen, W. C. (1910), *Johnstown folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 174, 16 p., unpublished data, locations of strip mines on topographic map, and crop line extended from adjacent area (unpublished map of Vintondale 7.5-minute quadrangle, Indiana County, by Bragonier, W. A., Rochester and Pittsburgh Coal Company [1986]). Other crop lines and structure contours modified by A. D. Glover from Phalen (1910) using unpublished data, crop lines and structure contours extended from adjacent area (Bragonier [1986]), and/or locations of strip mines on topographic map.

COAL CROP LINES AND STRUCTURE CONTOURS

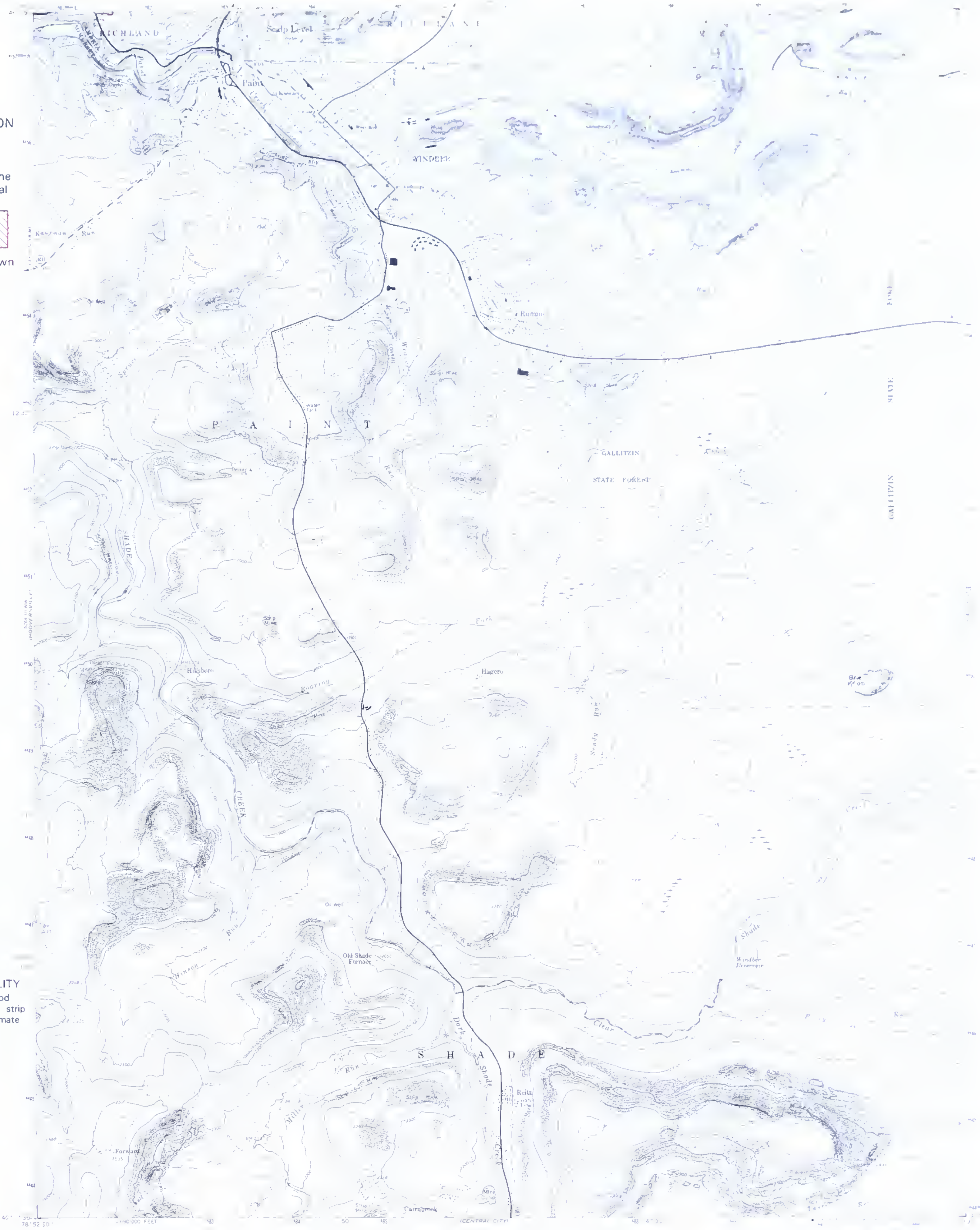
VINTONDALE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

— Crop line of the Brookville coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Richardson, G. B. (1934), *Somerset-Windber folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 224, 14 p., using unpublished data and location of strip mine on topographic map.
Limits of strip mining based on interpretation of topographic map.

WINDBER

CROP LINE AND MINED-OUT AREA OF THE
BROOKVILLE COAL

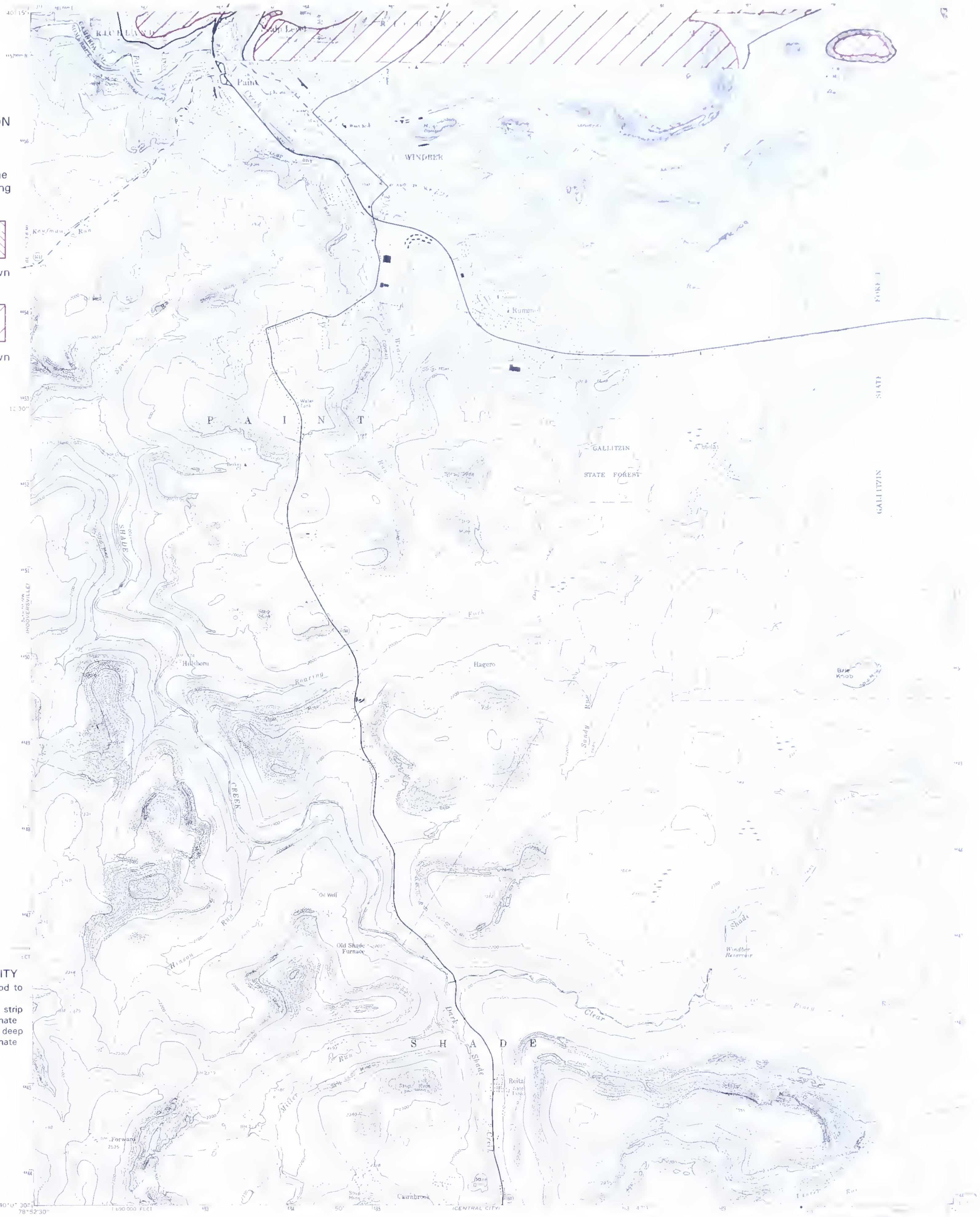
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Lower Kittanning coal

▨ Extent of known strip mining

▨ Extent of known deep mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1981 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SOURCES

Crop line modified by A. D. Glover from Richardson, G. B. (1934), *Somerset-Windber folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 224, 14 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.
Limits of deep mining from unpublished mine map.

WINDBER

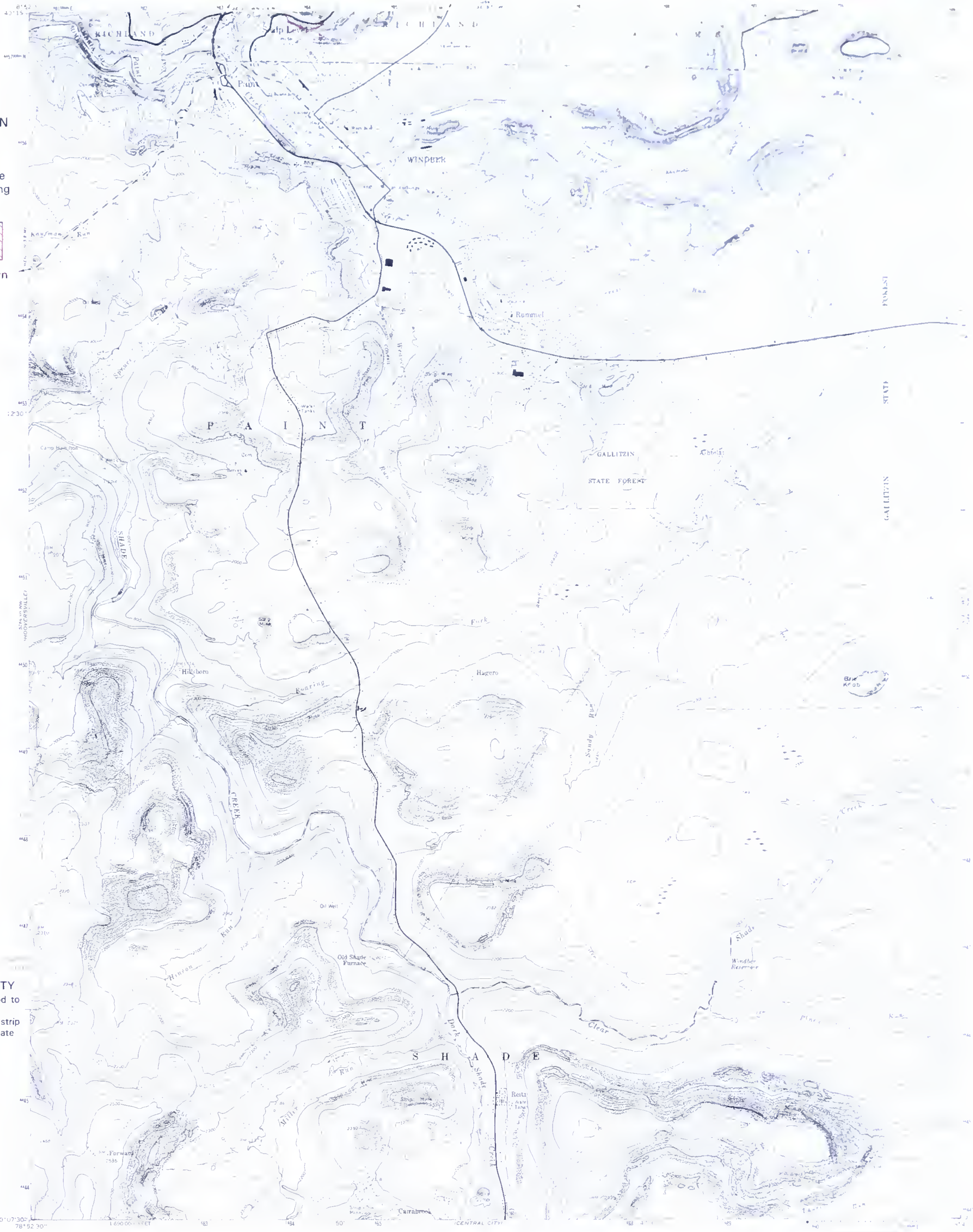
CROP LINE AND MINED-OUT AREAS OF THE
LOWER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〜 Crop line of the Middle Kittanning coal

▨ Extent of known strip mining



MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Richardson, G. B. (1934), *Somerset-Windber folio, Pennsylvania,* U.S. Geological Survey Geologic Atlas of the U.S., Folio 224, 14 p., unpublished data, and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.

WINDBER

CROP LINE AND MINED-OUT AREAS OF THE

MIDDLE KITTANNING COAL

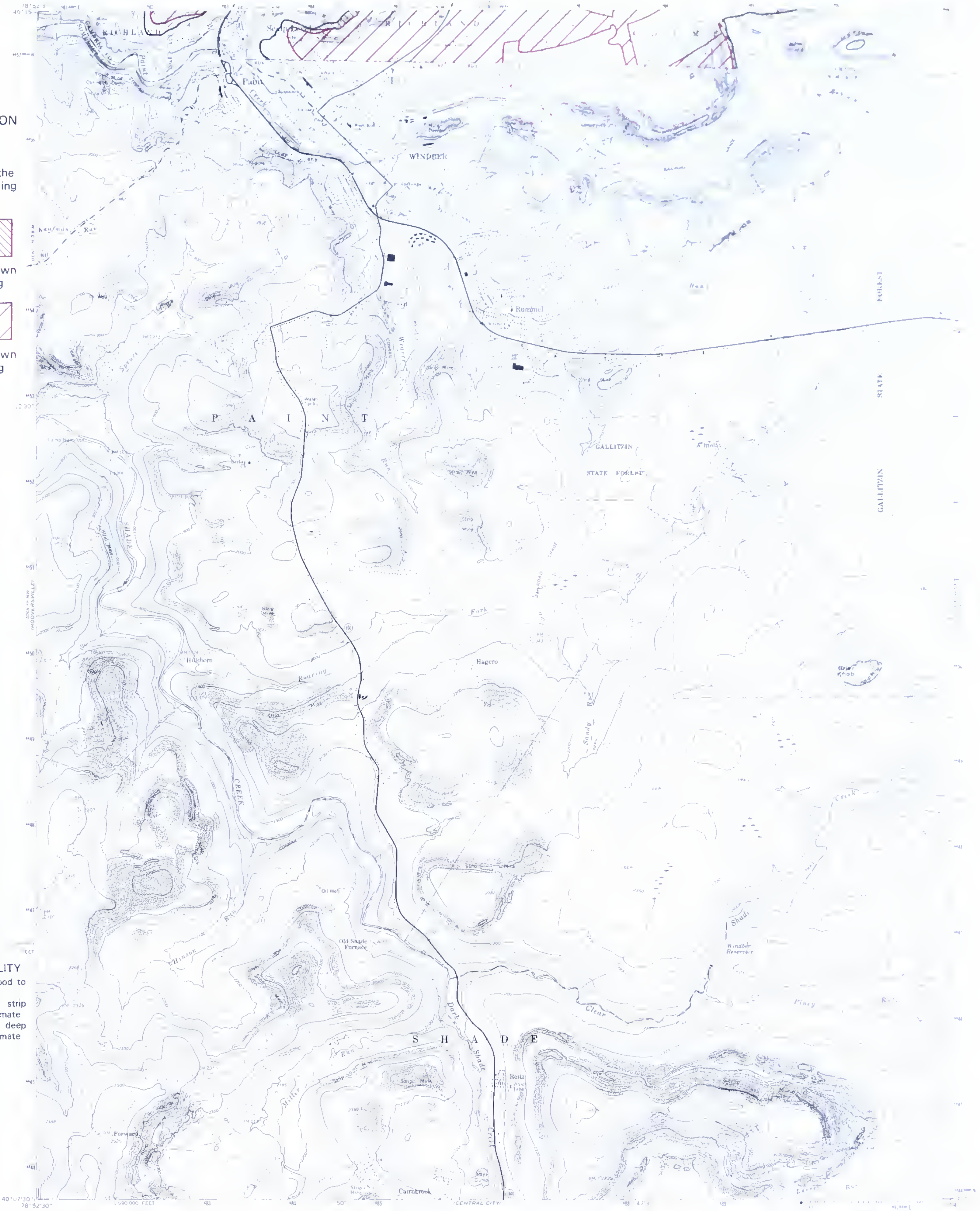
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

〰 Crop line of the Upper Kittanning coal

▨ Extent of known strip mining

▧ Extent of known deep mining



MAP RELIABILITY
Coal crop line--good to very good
Limits of known strip mining--approximate
Limits of known deep mining--approximate

SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SOURCES

Crop line modified by A. D. Glover from Richardson, G. B. (1934), *Somerset-Windber folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 224, 14 p., using unpublished data and locations of strip mines on topographic map.
Limits of strip mining based on interpretation of topographic map.
Limits of deep mining from unpublished mine map.

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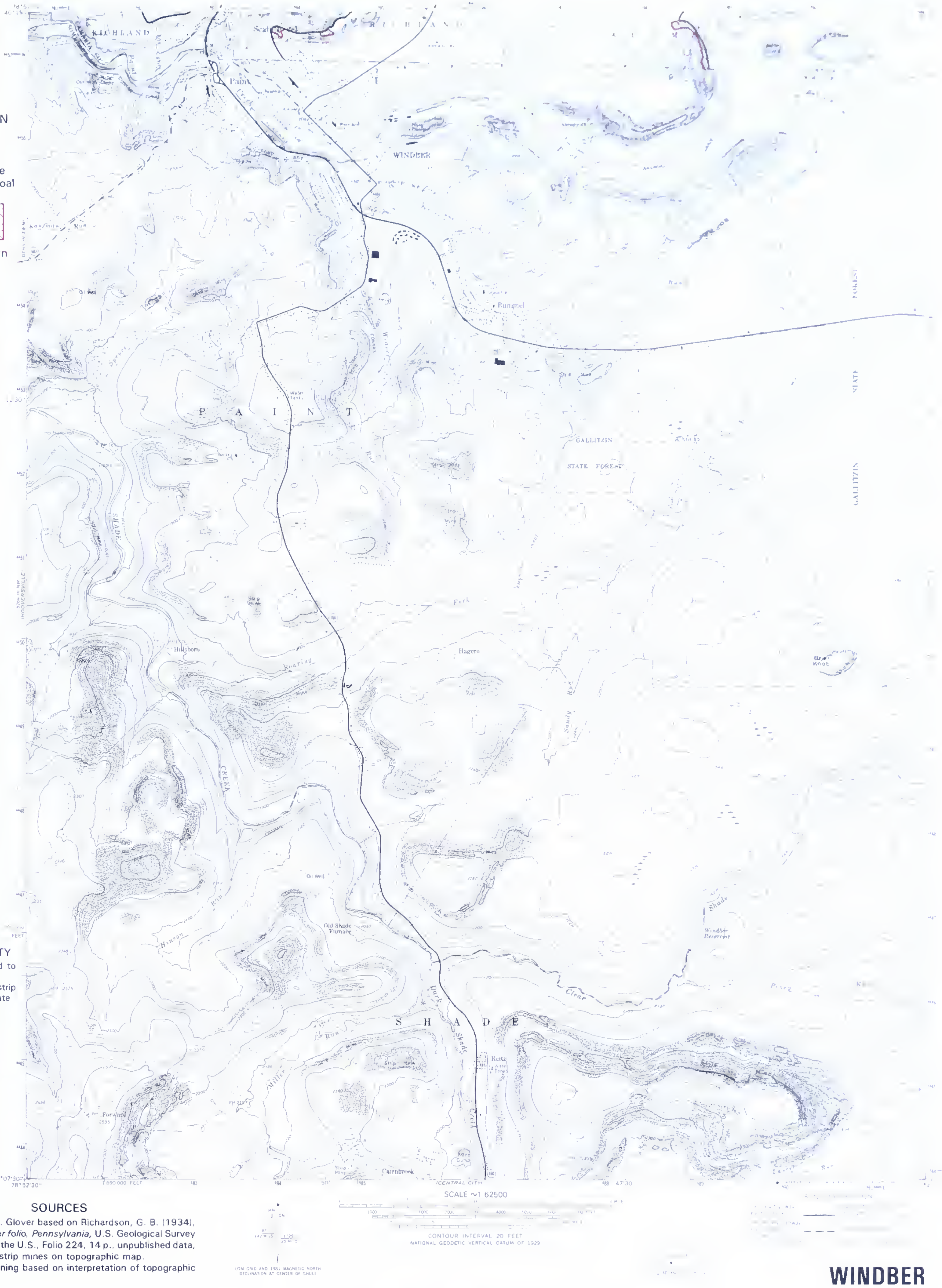
CROP LINE AND MINED-OUT AREAS OF THE

UPPER KITTANNING COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



EXPLANATION

〜 Crop line of the Lower Freeport coal

▨ Extent of known strip mining

MAP RELIABILITY

Coal crop line--good to very good

Limits of known strip mining--approximate

SOURCES

Crop line by A. D. Glover based on Richardson, G. B. (1934), *Somerset-Windber folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 224, 14 p., unpublished data, and locations of strip mines on topographic map.

Limits of strip mining based on interpretation of topographic map.

WINDBER

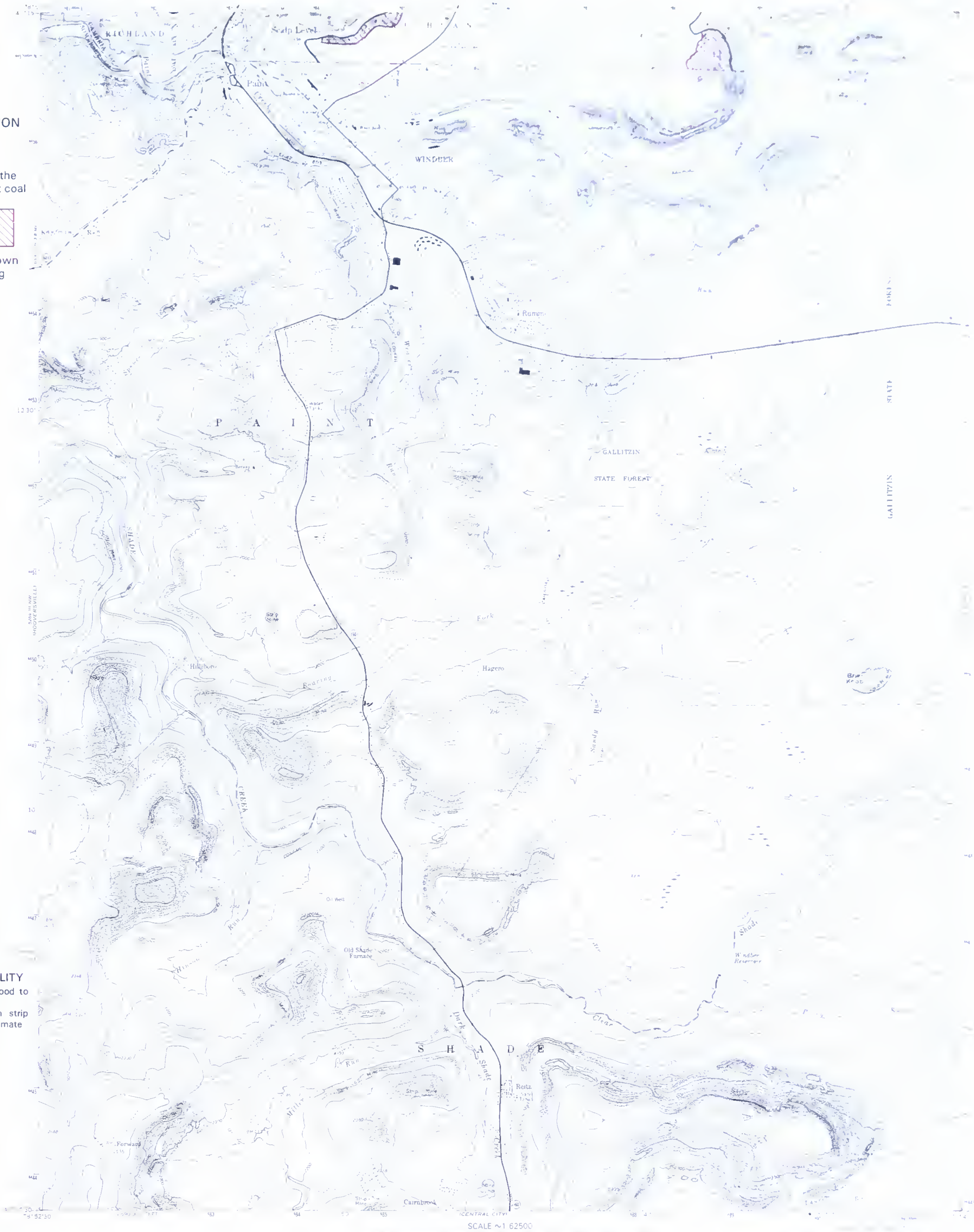
CROP LINE AND MINED-OUT AREAS OF THE LOWER FREEPORT COAL

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EXPLANATION

Crop line of the Upper Freeport coal

▨ Extent of known strip mining



SCALE 1:62500

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP RELIABILITY

Coal crop line--good to very good
Limits of known strip mining--approximate

SOURCES

Crop line modified by A. D. Glover from Richardson, G. B. (1934), *Somerset-Windber folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 224, 14 p., using unpublished data and locations of strip mines on topographic map. Limits of strip mining based on interpretation of topographic map.

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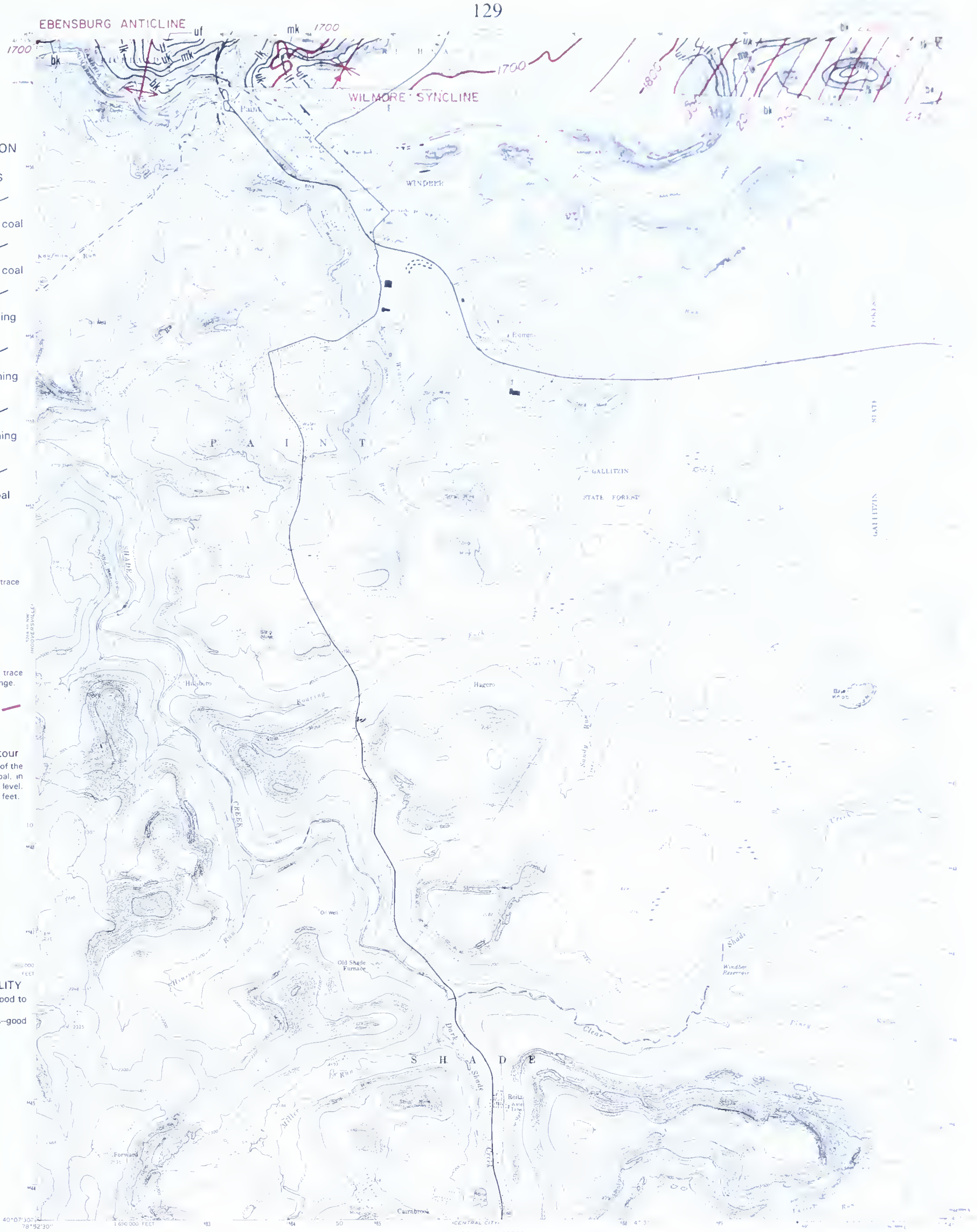
CROP LINE AND MINED-OUT AREAS OF THE UPPER FREEPORT COAL



EXPLANATION

CROP LINES

—uf— Upper Freeport coal

—lf— Lower Freeport coal

—uk— Upper Kittanning coal

—mk— Middle Kittanning coal

—lk— Lower Kittanning coal

—bk— Brookville coal

Anticline
Showing axial-plane trace

Syncline
Showing axial-plane trace and direction of plunge.

—2000— Structure contour
Altitude of the base of the Lower Kittanning coal, in feet above mean sea level. Contour interval 50 feet.

MAP RELIABILITY

Coal crop lines--good to very good
Structure contours--good to very good

SOURCES

Crop lines of the Middle Kittanning and Lower Freeport coals by A. D. Glover based on Richardson, G. B. (1934), *Somerset-Windber folio, Pennsylvania*, U.S. Geological Survey Geologic Atlas of the U.S., Folio 224, 14 p., unpublished data, and locations of strip mines on topographic map.

Other crop lines and structure contours modified by A. D. Glover from Richardson (1934) using unpublished data and locations of strip mines on topographic map.

WINDBER

COAL CROP LINES AND STRUCTURE CONTOURS

PENNSYLVANIA
DER